NATIONAL
LIBRARY OF AUSTRALIA

DOHM

http://www.nla.gov.au/preserve/dohm

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Digitisation of Heritage Materials

While most large cultural institutions are capable of setting up digitisation programs of their own, many smaller organisations or groups struggle with covering significant initial costs and trying to acquire the knowledge required to run a successful digitisation project. Obviously, commercial solutions are available but they tend to be expensive and aimed at the upper end of the market – organisations that can afford to purchase professional equipment, software and expertise.

Recognising these difficulties, the National Library explored possible alternatives and in due course developed a basic training program in digital copying and archiving of still images. The objective of the program is to provide participants with practical skills to capture, manage, preserve and provide access to digital images. The course's aim is to teach best digitisation techniques and practices using least expensive options currently available. We believe that recent advances in technology permit successfully running of digitisation projects on a very tight budget.

Initially, a very successful pilot training course was held at the National Library of Australia (Canberra, Australia), in June 2007. It included a full day of theory and another full day of hands-on modules. The Library provided all materials and digitisation equipment. Since then, multiple DOHM seminars were held at the National Library, various institutions across Australia and overseas.

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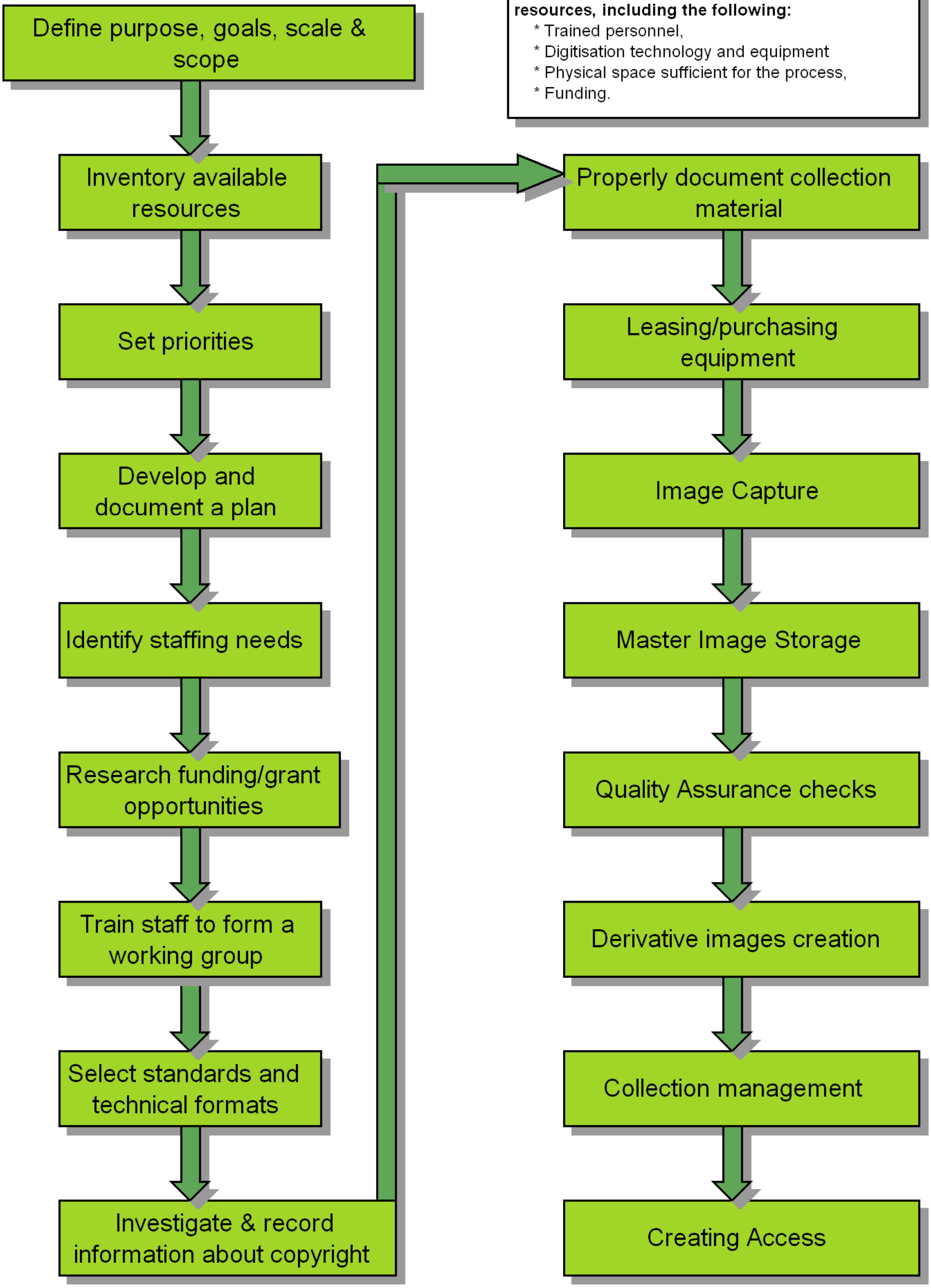
PROJECT PLANNING

Successful digitisation projects require a range of resources, including the following:

* Trained personnel,
* Digitisation technology and equipment
* Physical space sufficient for the process,
* Funding.



Define purpose, goals, scale & scope
Inventory available resources
Set priorities
Develop and document a plan
Identify staffing needs
Research funding/grant opportunities
Train staff to form a working group
Select standards and technical formats
Investigate & record information about copyright
Properly document collection material
Leasing/purchasing equipment
Image Capture
Master Image Storage
Quality Assurance checks
Derivative images creation
Collection management
Creating Access

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CAPTURE YOUR COLLECTIONS: SMALL MUSEUM VERSION

a collaboration between

CHIN training and AMOL Australian Museums & Galleries Online

PLANNING

IMPORTANCE OF PLANNEING DEFINING AUDIENCES EVALUATION ASSETS
RESOURCES & REDUCING COSTS OCCUPATIONAL HEALTH & SAFETY EXERCISES

THIS MODULE WILL EXPLAIN:

- What resources a digitisation project requires
- What you need to consider before beginning a digitisation project
- How to determine priorities for digitisation
- How digital images can be used
- What images and formats you can use
- What occupational health and safety issues you should consider

IMPORTANCE OF PLANNING

Most museums take a 'project' approach to digitisation, while others systematically digitise all or large parts of their collections. Whichever approach you adopt, planning is critical to the success of the project. In 1998 the Claremont Museum in Perth, Western Australia, systematically digitised its collection of 2,000 historic photographs of the town. The Claremont Museum is a local history museum with three full-time staff and 12 volunteers. The project took twelve months and utilised the services of an external contractor who scanned photographic negatives to produce a CD ROM. "To effectively coordinate all our efforts," explained Penny Kollosche, the curator, "we devised a detailed plan that not only outlined when certain tasks were to be undertaken but also, by whom. Right at the beginning it was important for us to undertake a skills audit to see who of our volunteers could do what. Where necessary we also provided training."

Whether or not your project aims to digitise all or only a part of your collection, before proceeding you need a plan. Very basically this plan should detail what will be digitised and in what order. But even before this plan can be developed you need to undertake an audit of resources you have, or may need to purchase. Ordinarily successful digitisation projects require a range of resources, including the following:

- Trained personnel,
- Digitisation technology and equipment (see more on Selecting hardware and software for your project in the Getting started module),
- Physical space sufficient for the process,
- Funding.

DEFINING THE AUDIENCE

Before a single image is digitised, the intended users of the images, both inside and outside your institution, should be determined. Furthermore, this audience should ideally be involved in the development of the project brief to ensure that their unique likes, dislikes and skills are taken into account.

The project leader should interview staff members, volunteers and others who will use museum images, asking about not only immediate uses, but future ones as well. If the primary intent of the digitisation project is to increase public access to your collection you should consider placing images on your web site or on a museum public access terminal. Alternatively they could be used in the creation of a CD-ROM or publication.

EVALUATING ASSETS

Some museums have thousands of photographs and objects and sometimes it can be difficult to decide which should be digitised first. To develop a priority listing it is often useful to consider the following questions:

- What objects have already been photographed?
- What documentation is available?
- Is copyright cleared?
- Existing images are in what formats?
- How are the images stored?
- What is the quality of the images?
- Are digitised images from a previous project available?
- At what resolution have the digital images been stored?

A survey of all of the photographic holdings of your institution should be carried out to determine not only what images are held in different parts of the institution but also in what formats these images are currently available.

Next is an assessment of the images currently available. Digitising already available images, such as colour transparencies, will be a less costly and time-consuming process than beginning 'from scratch'. Some objects will need to be rephotographed if the images on hand are in poor condition or are not good representations of the original object. Ideally only good, professionally photographed images created with a colour bar or grey scale should be digitised. If previously created digital images are available, be careful to consider whether the quality is high enough for your current needs, and whether the associated documentation is adequate. New photography will add significantly to the time and money required for a digitisation project, particularly when the objects to be photographed require significant preparation time.

PRIORITISING THE WORK

Even if the long-term goal is to digitise the entire collection, the project will probably be done over time in accordance with financial and staff constraints. To achieve this, all work needs to be prioritised according to the project plan previously defined. Generally, priority should be given to the following:

- Images for which you have copyright clearance,
- Iconic images significantly associated with your institution,
- Images for which you have good documentation,
- Objects used in exhibits, current or upcoming,
- Images of the museum that could be developed into a virtual tour or promotional publications,
- New acquisitions,
- Well-formed collections of particular significance or special public and/or educational appeal,
- Images following a particular theme or subject area,
- Natural groupings in your collection.

RESOURCES AND REDUCING COSTS

Defining the resources required

Your digitisation project will have an impact on budget, staffing, workload, available space and equipment. Staff with the necessary skills will need to be hired or trained (at the least, to document and manipulate the images if the work is contracted out). If existing staff is trained, consider how their ongoing workload will be affected. There are a diverse set of skills required for any digitisation project and often in smaller institutions individuals will need to carry out one or more of the following tasks:

Administration

- Project management,
- Project leadership,
- Supervision of production.

Collections management or subject specialists

- Cultural material documentation, including composing descriptive information about objects as well as data about the images,
- Cataloguing and documenting digital objects,
- Collections management software expertise to link images with the appropriate documentation,
- Preparation and conservation tasks,
- Photographic expertise.

Systems support

- Technical expertise in operating digitisation hardware and software,
- Photographic expertise if capturing images in-house,
- Experience with image scanning, processing and quality control,
- ongoing management and operation of the database.

Reducing costs

Some institutions may find many of these resources, particularly human resources and computer equipment, either hard to come by or too expensive. However there are a number of practical ways to reduce costs by building upon local expertise or seeking out additional partners, here are a few suggestions:

- Approach your local university or secondary school for technical assistance
- Approach the museum studies, history or computer faculties of local universities to see if they will make interns available
- Partner with one or more local museums to share costs and expertise
- Approach your local council or municipality, to see if they have a grant scheme or are willing to make funds available
- Use local newspapers and rotary groups to recruit new volunteers with digitisation skills
- Approach your local employment agency to see if grants are available to employ and train unemployed people
- Approach your local museum association to see if there are grants or training schemes for digitisation projects
- Approach local business to see if they are willing to offer financial support
- Approach local schools to see if they can offer access to computer and digital photography equipment
- Approach your local library or telecentre to see if they will give you access to their equipment and/or technical support.

Computer Workstations - occupational health and safety issues

It is very likely that when setting up your digitisation project you will install one or more computer workstations. The way you design these workstations needs to be carefully considered so staff and contractors can work without discomfort or risk of injury. There are many web-based resources that can help you with the design of this environment, one of the best is Cornell University’s Ergonomics website. Here you will find a comprehensive overview of the dos and don’ts of designing a computer workstation.

EXERCISES

There are two exercises in this section. One will help you develop an overall project plan, The second will be useful to those institutions with extensive photographic holdings as it will help you analyse the status of your photographic collection.

Exercise 1.

Having considered who the audience might be, along with your institutions' level of knowledge, practical expertise and funding, a project plan can be drafted. It is important to note that decisions made while planning the project affect the entire process. For example, decisions about the resolution of scanned images, or the amount of documentation, can dictate how the images themselves are used. The project will not be successful if images must be rescanned in a few years because of poor initial choices of technology or documentation. Use the following exercise to help you compile your project plan.

The following broadly defined tasks or phases should be part of the overall plan:

Planning	Responsible	Timeline	
		Begin Date	End Date
Define the purpose, goals, scale and scope of the project			
Survey current images to assess the strengths of the collection			
Evaluate current documentation and standards used to create it (see more in the Standards module)			
Analyse technical standards			
Inventory available equipment			
Set priorities			
Develop and document a plan, including workflow strategy			
Identify staffing needs			
Assess costs and implications of doing projects in-house vs. contracting out the work (see more in the Costs module)			
Research funding/grant opportunities			
Select/hire/recruit, and train staff to form a working group or project team			

Data preparation	Responsible	Timeline	
		Begin Date	End Date
Select data documentation standards, and technical formats and standards (see more in the Standards module)			
Investigate and record information about copyright, restrictions, permissions (see more in the Legal Issues module)			
Properly document photographs of collection material, whether they are being contracted out or digitised in-house			
Where images exist, ensure that the image and its documentation are stored or linked together			

Image capture	Responsible	Timeline	
		Begin Date	End Date
Purchase or lease and set up equipment			
Take high-quality photographs of objects			
Where photographs already exist, scan the photographs of the objects (or send them to an outside source, with explicit instructions about requirements)			
Store high-resolution images securely			
Quality assurance checks			

Storage and delivery	Responsible	Timeline	
		Begin Date	End Date
Store the photographs of collection materials properly			
Store any CDs produced securely in appropriate environmental conditions			
Investigate the feasibility of linking digital images to the collection management database			
Investigate the feasibility of making images available online			
Ensure off-site storage of copies for security purposes			

Exercise 2.

The following exercise will help you assess the size and potential copyright issues you may have with existing images you wish to digitise. When complete, this exercise will help you determine which of your images may be the easiest, or most suitable for digitisation and thus will help you prioritise your work.

Image Format	**Total**	**Dimensions**	**Location**	**Copyright**	**Image Quality**	**Comments**
Colour transparency						
Colour print						
Colour negative						
Black and white contact sheet						
Black and white photographic print						
Black and white negatives						
Black and white slides						
Polaroid						
Colour slide						
Microfiche						
Other						

Do you understand:

- What kind of resources you will require to complete the digitisation project?
- What your digital images will be used for?
- Who will use your digital images?
- Why you need to evaluate your collection before starting the project?
- How you prioritise what should be digitised first?
- What kinds of staff and skills you need for an image digitisation project?
- How you can go about reducing some of your digitisation costs?

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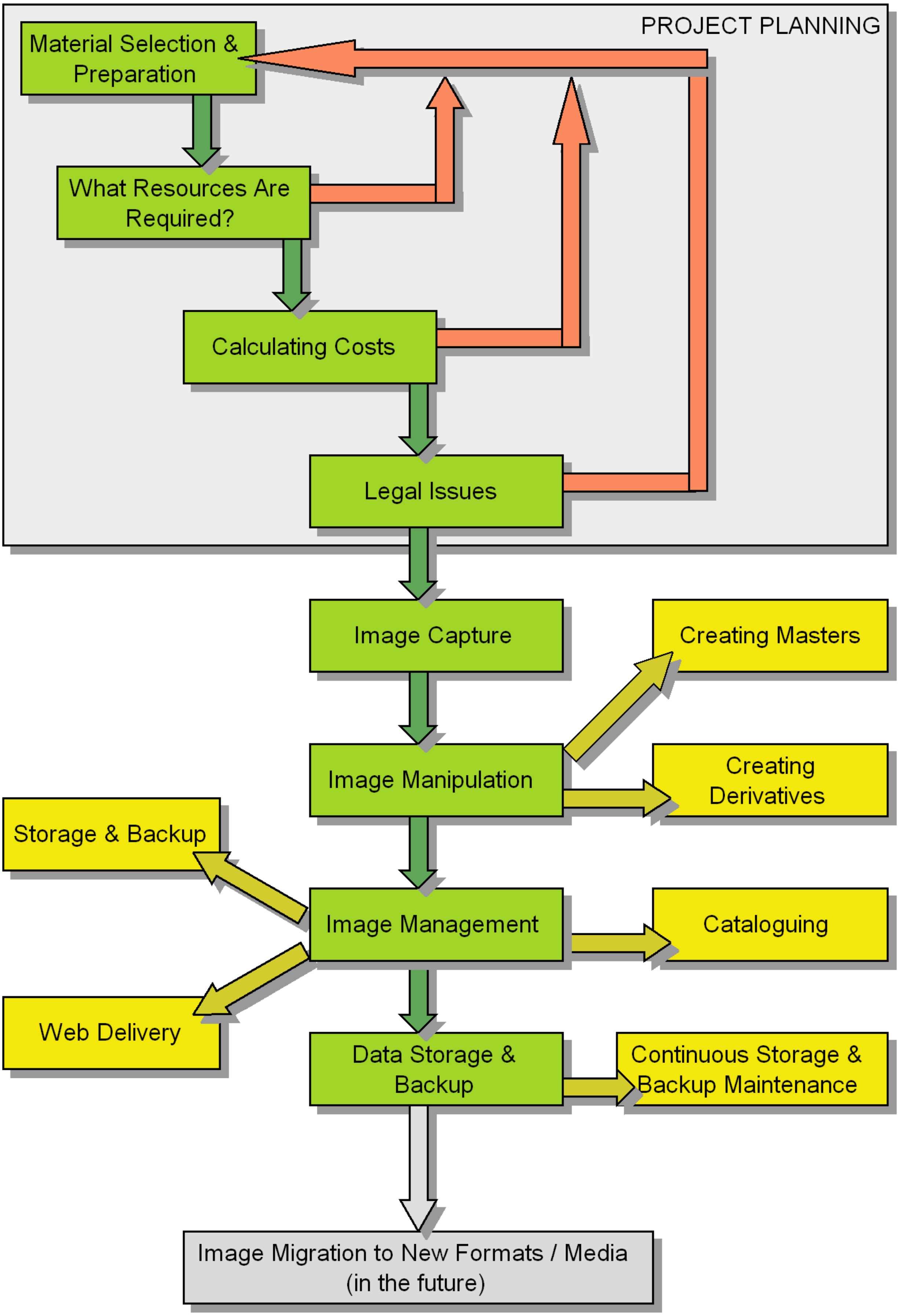
ARCHIVAL DIGITISATION WORKFLOW



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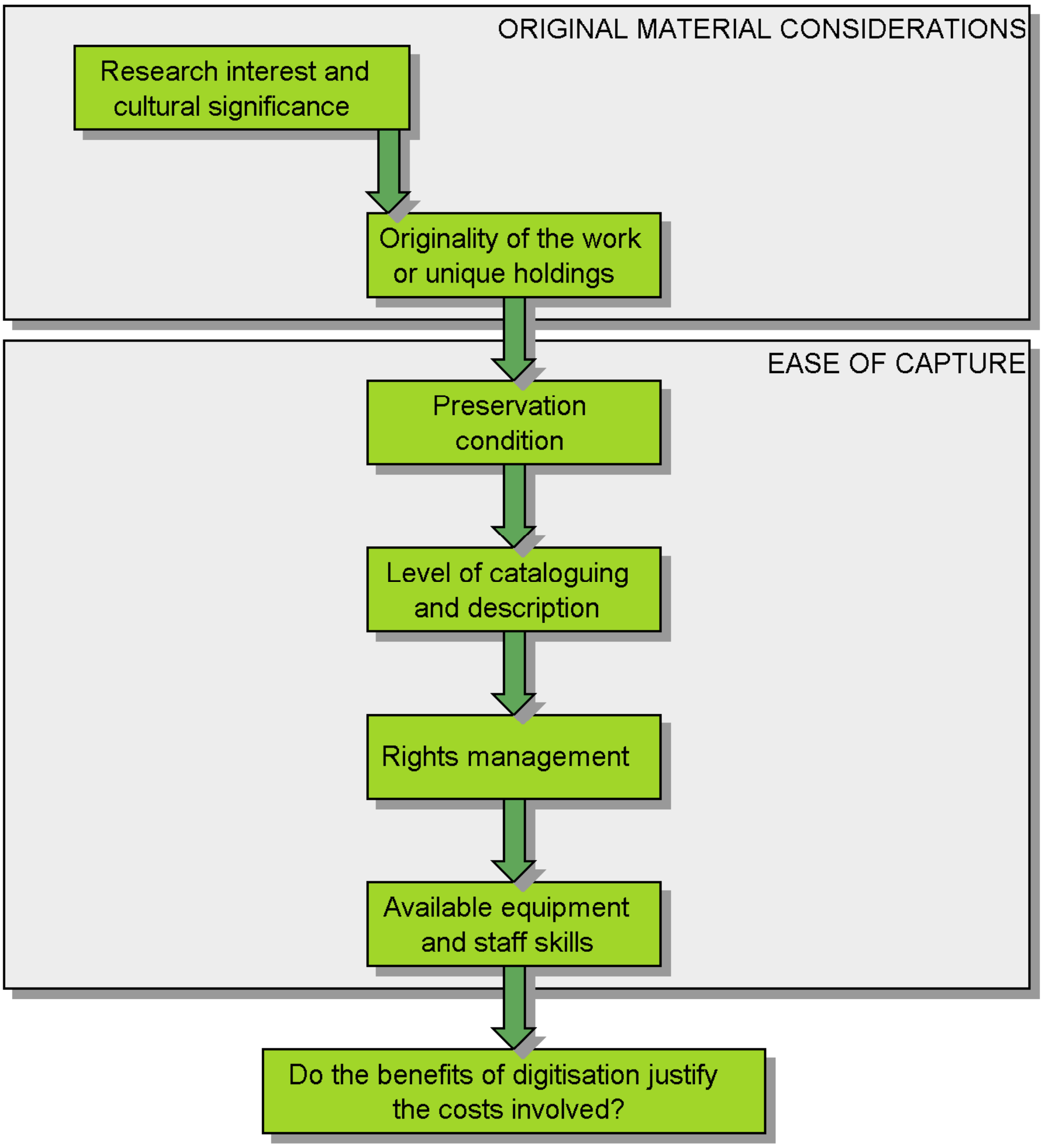
MATERIAL SELECTION & PREPARATION


ORIGINAL MATERIAL CONSIDERATIONS
Research interest and cultural significance
Originality of the work or unique holdings
EASE OF CAPTURE
Preservation condition
Level of cataloguing and description
Rights management
Available equipment and staff skills
Do the benefits of digitisation justify the costs involved?

Generally, priority should be given to the following:

- Images for which you have copyright clearance,
- Iconic images significantly associated with your institution,
- Images for which you have good documentation,
- Objects used in exhibits, current or upcoming,
- Images of the museum that could be developed into a virtual tour or promotional publications,
- New acquisitions,
- Well-formed collections of particular significance or special public and/or educational appeal,
- Images following a particular theme or subject area,
- Natural groupings in your collection.

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Cataloguing the Objects

These are excerpts from *Small Museums Cataloguing Manual* by Museums Australia, Victoria. For more detailed information see http://www.mavic.asn.au/assets/Small_Museums_Cataloguing_Manual_4th.pdf

The Catalogue

Introduction

The catalogue is a repository for knowledge about the museum's most culturally valuable asset – its collection – as well as a tool for managing object information and for helping administer the collection.

Cataloguing comprises the very specific task of object documentation, but it exists within a broader museum context. This chapter first looks at documents that inform how a collection is shaped and managed, and then discusses cataloguing 'worksheets', cataloguing tools, safe handling of objects during cataloguing and the management of digital files. Registration and object numbering form part of the broader context of cataloguing, but these aspects are covered in the dedicated chapter that follows.

Policy documents

The 'statement of purpose' and the 'collection policy' are two of the most important documents the museum will produce. Together they describe its role, responsibilities and objectives, and they guide and inform the work of staff and volunteers. They are fundamental to how the museum operates and they better position the museum to determine how its collections will be used.

Statement of purpose

The statement of purpose clearly and succinctly outlines the museum's intention, expressing its philosophy and vision. It is a short written statement that includes:

- the primary reason for the museum
- the functions of the museum
- the subject area, time period and geographical location covered by the collection, and
- a clause for reviewing the statement.

Clearly articulated objectives enhance museum management, providing a touchstone for managers when devising short- and long-term plans. For staff and volunteers they create a focused and collaborative working environment, with individuals working towards clear common goals. Once endorsed by museum management, the statement of purpose can be made publicly available, and included in the museum's policy documents and public relations material.

Collection policy

The collection policy is a management tool that describes what sort of material the museum will collect and how it will care for its collection. It is essential to the work of the cataloguer, as it helps determine the material that will take priority and be comprehensively documented.

From *Small Museums Cataloguing Manual* – Museums Australia Victoria.

This detailed policy document sets out the criteria against which proposed acquisitions are assessed, so that the museum retains the clear vision expressed in its statement of purpose. It explains how the museum cares for its collection, outlining documentation, conservation, loans and de-accessioning procedures. The collection policy should include:

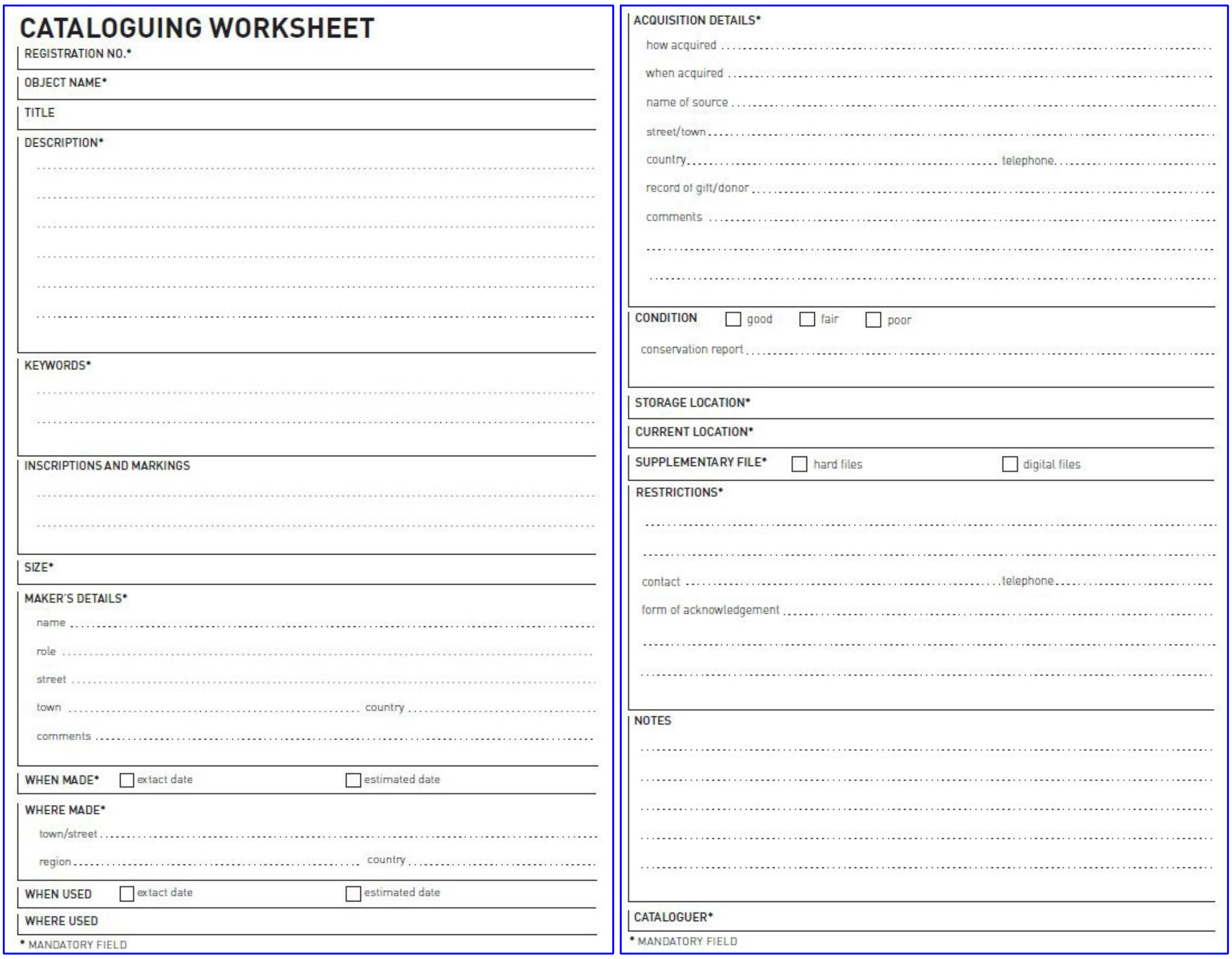
- the museum's statement of purpose
- what it will collect and how
- criteria guiding object acquisition
- procedures for collection care, documentation and recordkeeping, conservation and storage, and loans, and
- a clause for reviewing the statement.

The result of a good collection policy is that the museum builds a strong and focused collection that is suited for display and research. The procedure guidelines included in the policy not only ensure the care of the collection, but they also increase staff and volunteers' understanding of the functions and responsibilities of the collecting organisation.

Introducing worksheets

A worksheet represents a single catalogue, or object, record – a unique record of information about an object. Together a group of records comprise the catalogue.

The worksheet has been created as the first stage of building or adding to a catalogue, as the object information recorded is then transferred to the computerised catalogue. A blank worksheet is shown below.



CATALOGUING WORKSHEET

REGISTRATION NO.*
OBJECT NAME*
TITLE
DESCRIPTION*
KEYWORDS*
INSCRIPTIONS AND MARKINGS
SIZE*
MAKER'S DETAILS*
name
role
street
town country
comments
WHEN MADE* ☐ extact date ☐ estimated date
WHERE MADE*
town/street
region country
WHEN USED ☐ extact date ☐ estimated date
WHERE USED
* MANDATORY FIELD

ACQUISITION DETAILS*
how acquired
when acquired
name of source
street/town
country telephone
record of gift/donor
comments
CONDITION ☐ good ☐ fair ☐ poor
conservation report
STORAGE LOCATION*
CURRENT LOCATION*
SUPPLEMENTARY FILE* ☐ hard files ☐ digital files
RESTRICTIONS*
contact telephone
form of acknowledgement
NOTES
CATALOGUER*
* MANDATORY FIELD

The worksheet has been devised with fields in which information about an object is recorded. These reflect the fields commonly used in museum cataloguing softwares. No matter what object is being catalogued – a lantern, a photograph or a plough, for example – the same type of information is recorded in the same field. This point cannot be overstated, for if a museum catalogue is centralised with similar catalogues and accessed broadly by museum professionals and others, it is crucial that the user interprets the data in the same way. Authority lists and thesauri are particularly useful in creating consistency in terminology and spelling across catalogue records.

Some catalogue fields are mandatory and must be completed for all objects; these have been indicated with an asterisk (*) on both the worksheet and in the explanations of relevant fields in the chapter ‘The Catalogue’. The completion of other fields (discretionary fields) depends on the object being catalogued or on the level information available.

The worksheet has been developed to record all relevant information about an object so that a comprehensive and meaningful catalogue can be created. But it cannot be the repository for all information about collection objects. Supplementary files support the catalogue; these are both hardcopy and digital files (the former usually stored in a filing cabinet) that contain further information about an object, such as its history, receipt of purchase and reference material. The supplementary files help keep the catalogue to a manageable size.

Cataloguing tools

To create a catalogue you’ll require both ‘manual’ and electronic tools. Because we suggest recording object information on worksheets before entering it into the electronic catalogue, this section is organised to reflect that process.

Workspace and manual tools

Space is important when documenting objects, as the risk of damaging items is increased in a small, cluttered or badly lit area. A designated cataloguing space is ideal, with a table large enough to hold both your cataloguing tools and the objects. It should be well lit and secure, as there will be times when collection material is left unsupervised. It is the cataloguer’s responsibility to ensure objects’ security during cataloguing and their return to storage on completion.

All cataloguing tools and materials should be on hand when you begin, and they should be of good quality. To complete the cataloguing worksheets you will need:

- blank worksheets
- HB pencils, preferably with retractable leads
- a quality eraser
- A4 plastic sleeves for housing each worksheet, and
- an A4 lever-arch binder in which to store the worksheets.

You will also need the following items for examining objects:

- a retractable metric measuring tape
- a metric ruler
- white cotton gloves, and
- latex or powder-free nitrile gloves.

Apart from the worksheets and nitrile gloves, these materials are available at newsagencies or art supply shops. A blank worksheet is included in the appendices to this manual, which you can print or photocopy as many times as you need to. Gloves are used to protect objects from the oils and salts of your skin while they are being handled. Cotton gloves are mainly used, but for objects with smooth surfaces such as glass they pose a risk. These objects are easier to grip with latex or nitrile gloves. Latex gloves are more readily available and affordable than nitrile gloves, which can be ordered from Mediflex Industries.

Computer

The computer and the cataloguing software – the database used to build a catalogue – are essential. In an ideal world, a central server will host the catalogue, so that it can be accessed from more than one computer. But a small regional or community museum is unlikely to have such resources, so the catalogue will live on a single computer. If a new computer is needed, ensure it is compatible with the museum's existing computer system. It will require sufficient memory to run the cataloguing software and extras, and to build the catalogue. Discuss your hardware and software needs with an IT expert, and if possible talk with others who have established and used a computerised catalogue. When deciding on the museum's computer requirements, it is worth considering how many catalogue users there will be and their computer experience, and the future requirements the catalogue: will the museum link to other catalogues via CAN (Collections Australia Network) or Picture Australia? Will it be a large catalogue of thousands of records? Will the catalogue be required to store digital image files? What reports might you want to run? What sort of extras, such as authority lists and thesauri, might be used? It's worth resolving such issues before purchasing a computer and software, as this can save time, money and heartache, and will satisfy the museum's immediate and long-term cataloguing needs.

Cataloguing software

There is a range of cataloguing software available. Websites for museum-based software such as Adlib, Maxus, Mosaic and Vernon will be useful in your research. Different softwares offer varying levels of sophistication, and they are priced to match. An off-the-shelf package for museums is the Inmagic TextWorks package 'Maxus Collections', which is based on our worksheet; Inmagic also produces 'Maxus Artworks' for galleries and artists cataloguing artworks. If you choose a software used extensively by museums throughout Victoria this will allow you to share tips and discuss catalogue issues with fellow users. Some softwares provide features such as efficient searching and reporting, image management and simple image-linking to records. When purchasing a software check whether a back-up service is available to provide assistance and upgrades, and whether this is free.

Authority lists and thesauri

Authority lists and thesauri are useful software add-ons that make cataloguing faster – and they make both cataloguing and information retrieval easier. They provide consistent terms and spelling by imposing standardised terminology.

Authority lists, also called 'look-up lists', are pop-up word lists that can be loaded into the catalogue database to control the terms used in specific fields. They are used in fields in which similar data recurs, such as those requiring the maker's role, town and country names, and information on how an object was acquired. Existing authority lists can be loaded or else lists can be self-generated.

Both approaches have benefits and disadvantages. An existing list requires very little maintenance but it may not cover the museum's needs as its collection grows, necessitating a large 'other' category to which new terms can be added. A self-generated list, on the other hand, requires greater maintenance and is the responsibility of the lead cataloguer. Once a new term has been typed into the field, it can then be added to the list for future use. But the cataloguer needs to be mindful that words are spelt correctly and the list doesn't become unwieldy. A large authority list can create ambiguity and confusion over preferred terms, especially if there are several co-cataloguers or if communication is poor.

A thesaurus is a more complex authority list, controlling subject terminology. Essentially it is a classification system, and it is used to control the preferred term(s) to describe an object. For example, an aeroplane could be described as a plane, an aircraft or an aeroplane by different cataloguers. All are correct, but what would a researcher use when searching the object records of the database. The thesaurus avoids such confusion by classifying according to a preferred term, and hierarchically grouping any related terms. The cataloguer can then select a general or specific term simply by scrolling through the given hierarchy.

A thesaurus is also used to place an object within a grouping of similar collection objects, but this is done through the Australia Picture Thesaurus (see the following paragraph). For example, you may wish to group all objects relating to food and drink containers under that name, so that 'food and drink containers' becomes the term for all similar items associated with the kitchen. But you may also want to include narrower or broader terms, such as 'ceramic cup' or 'domestic technology' respectively. (More descriptive details, such as 'floral pattern', can be entered into the 'description' field so do not need to be part of a thesaurus.) A good thesaurus will provide such a hierarchy of terms, which enable broad and narrow searches to be made with relative ease.

You can use an off-the-shelf thesaurus, or more than one if you have a large and complex collection. If you're considering using multiple thesauri, we strongly advise that you consider your resources and the nature of the collection first. Thesaurus building can be a long and tedious task requiring expertise, so we don't recommend this. But it's possible to customise existing lists. Australian Picture Thesaurus (APT) in effect encourages this by welcoming cataloguers to submit terms to the central managing body, which updates the main thesaurus every three months.

There are many thesauri available. The National Library of Australia provides a list of Australian-specific thesauri, including for Indigenous terms, images, photographs and manuscripts. A comprehensive thesaurus such as the APT is good, as it provides Australian terms and is broad ranging. It is hosted by the State Library of New South Wales and is free to download. It is continually modified, so you need to download it regularly. Alternatively, the APT can be used online, which means you will always have the latest terms. You can check the website at www.picturethesaurus.gov.au to see if the preferred terms are relevant for your museum's collection.

Handling objects

During cataloguing you will need to handle collection objects to some degree. A guiding principle is that objects should be handled as infrequently as possible, as this reduces the risk of damage and deterioration.

Even when an object is small and light it should be handled with both hands and with great care. In most cases gloves should be worn, so that objects are protected from the oils of your skin and remain in as pristine a condition as possible. There will be occasions on which you should exercise your discretion about the sense of using cotton gloves. These would be simply too slippery when handling, for example, objects made of crystal, glass or some ceramics. You can wear latex or nitrile gloves, or if gloves are not worn, make sure your hands are clean and dry before handling objects. To reduce the risk of damage, you can examine objects over a padded or covered bench top.

Before moving an object check for points of weakness and/or damage that could be exacerbated through handling or lead to it being dropped. These will determine how it should be handled and carried. Handles or rims may have been weakened by age or general deterioration, so avoid carrying objects by these components; always support objects by their base. If you are moving two or more small items it's advisable to place them in a padded box or padded plastic tub before moving them. Otherwise, make sure the objects are moved one at a time.

When furniture is being moved it should be carried and not dragged. Often it will require more than one person, so ask for help and have an agreed game plan and cleared pathway before you begin. If a small team is required, it's best that one person directs and supervises activities. And remember to check doorway clearances before you begin.

Managing digital files

The storage capacity of your computer system is important, as it will determine the amount of digital information you can store for the long term. We don't recommend indefinite storage of files on CDs or DVDs; an external hard drive is a good option.

You may find that you are collecting a large number of digital documents relating to your collection. These can be emails, Word documents, requests for information or additions to object data, or requests to publish collection images. These files must be stored in an organised fashion, just as 'hard' documents are filed systematically for easy retrieval. A good system is to create folders by registration number, seeing as this is the unique identifier for each collection object. If an object has a large digital supplementary file, you might want to use subfolders such as 'Research material', 'Images', 'Correspondence', with files named in a manner that indicates their content.

High-resolution digital photographs – for reproduction in publications, exhibition catalogues, newsletters and the like – can also be stored. Because of their large size, it's best to store them on a different server or hard drive from that which hosts the catalogue. As noted above, they can be stored in folders named by registration number.

Naming image files can be complex. If you name each by the object's registration number, how do you cope with multiple views of one object? One system is to give each an image number, which is added to a spreadsheet recording all images. The spreadsheet should have columns for the following information:

- image number
- object's registration number
- image description
- photographer

- source and copyright owner
- rights information (e.g., copyright, or cultural rights in the case of Indigenous material), and
- date taken.

This spreadsheet is a map of sorts, which allows for both the quick location of the image you're after and an overview of all digital photographic material of collection objects. To work as it is intended, the spreadsheet must be updated as new photographs are taken. It can be stored in the digital 'supplementary file' folder.

Low-resolution digital photographs can be linked to catalogue records as reference images, so these will need to sit on the same hard drive as the catalogue unless the computer is linked to a server.

The Register

Introduction

Registering objects has a natural relationship with cataloguing them, as an object must be formally registered before it is documented. During registration an object is assigned a unique and permanent identification number, which distinguishes it from all other items held in the collection. This chapter explains the procedures for registering and numbering objects.

Registering objects

Each collection object acquired by a museum must be entered into its registration book, also known as the 'acquisitions register'. It is used only for objects entering the permanent collection, as a separate book is used to record items arriving on temporary loan. Ideally, one person will be responsible for the register and access to it will be limited.

The book should be permanently bound, with stitched binding and a heavy-duty cover, and have ruled and numbered pages of quality paper. This may appear old fashioned in the digital age, but the register is the museum's most important primary reference of the collection, and a back up if the catalogue cannot be accessed and worksheets are misplaced. The book should be kept in a safe cabinet to guarantee its security.

Entries are made to the book using a calligraphy, Rotring or fountain pen, and with black fade- and waterproof ink, such as Indian ink. The registrar's handwriting should be clear and neat, and all information should be double-checked for accuracy as it is entered. Minor errors can be deleted using correcting fluid, but resist writing over this as the dried fluid can flake off, taking the information with it. Alternatively, rule a line through an incorrect entry; the correct information can then be written just above it – signed and dated, just as you would a wrongly scribed cheque.

Ideally, each double-page spread of the register should be ruled into seven columns titled:

- registration date
- registration number
- object name and description
- acquisition method

- acquisition date
- source's name and address
- comments.

The width of the columns for 'object name and description' and 'source's details' will need to be wider than the other five columns. The following sections explain the information required for each column.

Registration date

The date the object is entered into the book is often different from the date it was acquired; it may have been acquired in 1985 but not registered for another five years or more. This is often the case when a museum has a large documentation backlog, or when a collection is acquired. The registration date indicates the pace at which registration is progressing and makes the acquisition date more meaningful.

Registration number

This is a unique identifying number that distinguishes one object from another. The entry of numbers is usually sequential, according to when the object was acquired. The simplest method is to begin at 1, but this is not imperative. Some museums use a compound numbering system, beginning with the year of acquisition followed by a sequential number. (If required, a third component could indicate what part of the collection the object belongs to, although this is unnecessary for most small museums.) The compound numbering system can quickly indicate when the object was received and may avoid very large numbers. If a museum has a backlog of objects to register, the simple sequential system is probably best.

In cases where objects are closely related – such as a cup and saucer, a pair of boots, or handcuffs and a key – a point numbering system can be used. This indicates an object has distinct but related parts, and it is more practical and intuitive than recording individual registration numbers for each component. A decimal point separates the registration number and the 'part number'. If a pair of babies' booties were registered, for example, the second part of the number would be '2', indicating two components make up the item and fall under the single registration number, as shown here:

Reg. No	Object name
1	Chair
2	Book
3.8	Coffee cup and saucer set
4	Money box
5	Map
6.2	Babies' booties, pair
7	Painting

While the register shows a single number (the reg. no. together with the highest part number; i.e., 6.2), each bootie is marked with the registration number plus the 'part number' – in the case of the booties, 6.1 and 6.2.

One drawback of this system is that additional pieces of a set may come into the collection. This is not an issue where you know you have the complete item, such as with the booties, but two additional coffee cups and saucers matching an existing set of four could be acquired. If this were the case, the registration number in the example above would need to change from 3.8 to 3.12. An alternative system is to have a registration number with no part number, but to note the parts on the labels attached to objects.

Where it is difficult to tell if objects are part of a set and you're in doubt as to whether to assign a part number or a separate registration number, create a separate number. You can then link the objects by recording the number(s) of any other parts in the 'comments' column of the register and the 'notes' field of the worksheet and catalogue.

Remember, that no matter what numbering system is used, it is imperative that each number is unique to an object. A number should never be assigned to more than one item, or reallocated if an object is de-accessioned. It is also important that an object only be registered once. If it is registered a second time, cancel one of the entries by ruling a line through the entry in the register and adding a note to 'comments'.

If an archive is acquired, it can be allocated a single registration number.
For information on managing an archive, we recommend you consult the National Archives of Australia's *Keep it for the future! How to set up small community archives*.

Once the registration number is generated, the object must carry that number.

Object name and description

Specify the object in a word or two (e.g., badge) and briefly describe it (e.g., silver-coloured metal, with two-tone blue enamel inset). A more comprehensive description will be given in the catalogue.

Acquisition method

It is useful to know whether the object was acquired by the museum through donation, purchase or by other means. The method of acquisition should be specified in this column.

Acquisition date

This indicates the object's arrival at the museum, not the date it is registered. Dates should always be written in full and in the same day-month-year form; for example, 16-04-1994.

Source's name and address

Whether the object was donated, purchased or collected by other means, the source's name (personal or company) and contact details must be recorded.

Comments

Important additional information is given in this column. It may highlight the object's significance or relate it to another object in the collection. Subsequent information about the object can also be recorded here, such as if it is missing or stolen, or has been de-accessioned or transferred, as shown below:

Comments
See reg. no. 35 and reg. no. 36
Part of the Bennett Collection
Stolen 17-03-2002
Or:

Comments
Reg. no. cancelled; object registered
twice in error, see reg. no. 212

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Original source URL: http://www.nla.gov.au/pres/conver/candh.html

CARE AND HANDLING OF COLLECTION MATERIALS

Adapted from National Library of Australia guidelines

The Storage Environment

Collections should be kept in a cool, clean and low light area to ensure they last as long as possible.

Both **temperature and humidity** should be monitored in collection areas and kept within optimum range.

Light speeds up the aging processes of paper, weakening the paper fibres and causing brittleness, discolouration and fading of collection items. So:

- Blinds should always be closed in storage areas.
- Don't put items where the sun can shine on them.
- Turn lights off.

Food and drink should never come close to the materials, they can stain paper and increase the risk of pest infestation. Even vases, potted plants and cups of coffee have a nasty habit of overflowing or spilling.

Water can seriously damage paper. Never leave any items on the floor because they will be damaged by even the smallest water leak.

If you see any **pests** (e.g. silverfish, cockroaches, mice) appropriate action should be taken.

Handling and Use

Most damage occurs to archive materials when they are being handled.
Wash your hands frequently. Hands should **always** be kept clean and dry while touching paper. Both skin oil and perspiration stain paper. Cotton gloves can be used, but might be too clumsy to handle fragile material.

Wet fingers should **not** be used to turn pages.

When working with any collection materials provide yourself with plenty of clean work space and keep items flat on the table and not held in your hands. Rare or tightly bound books should be laid open on a book support.

Never lean on books or documents for a writing surface. Use pencil when you are working with collection materials.

If essential notes, such as identification numbers, need to be made, use a soft lead pencil(e.g. HB or B).

If pages of books and other items must be marked use acid-free paper strips. Do **not** fold the corners of pages or use printed, coloured or adhesive paper, such as "post-it" self-adhesive notes.

Photocopying

Photocopying is one of the major causes of damage to collection material. Some materials are difficult to handle and copy safely. Most importantly, don't press down on the spine of books while photocopying and take extra care with large and heavy books. There are some types of materials which are so fragile they should not be photocopied at all.

Transport

If you have to move more items than can be held comfortably in one hand, use a trolley. **Never** overload a trolley. Make two trips.

Storage

Unnecessary metal paper clips, paper fasteners, pins and staples should be removed; rust stains and holes will eventually result if these are left in place. Remove carefully and if necessary replace with smooth, solid plastic paper clips, white cotton tape ties or an acid-free folder or pocket. Rubber bands should be removed and discarded because they curl and tear the edges of paper and will eventually age and break.
Try not to overstuff or underfill storage boxes - overstuffing cramps and creases items, underfilling allows sagging and bending. Use fillers made of acid free materials.

Books

Generally books should be supported upright on the shelf by other books or bookends. Books left leaning on shelves can cause the book to become distorted and the binding may break. Large books such as elephant folios and broadsheets should be stored flat on the shelf otherwise the weight of the pages can damage the binding, but do not stack them too high or they will be difficult to remove.

Do **not** overcrowd the shelves. Books should slide easily onto the shelves without force. Make space if they don't. Shelves should be deep enough to fully support the volume and leave a space between the books and the back of the shelf to allow air circulation.

A book should be removed from the shelf by grasping firmly the centre of the spine. Never remove books from the shelves by pulling at the top of the spine, this is the most vulnerable part of the spine, and can tear or break easily.

Pamphlets

Pamphlets can easily be lost or damaged on shelves because they are so small. If placed straight on the shelf or in a half-filled upright pamphlet box, they can become slouched, squashed and crushed. Individual pamphlets can be stored in Mylar pockets or see-through polypropylene folders and groups of pamphlets and serial issues in grey polypropylene serial boxes.

Single Sheet Documents

Single sheet material is best stored flat in folders or boxes, but may be stored upright in a polypropylene pamphlet folder or with adequate support in a folder in an archive box if the archive box has been filled to prevent its contents sagging.

If any items are handled frequently, they should be placed in a Mylar pocket or copied, to protect the original item.

Large Sheet Material

Large sheet material should be stored flat in shallow plan cabinet drawers. Drawers should not be overfilled because this will make retrieval difficult and sheets can easily be damaged as the drawers are opened and closed. Do not fold any item, it will eventually break along the fold. If material is too large to fit in drawers it can be placed in a folder in an adequately sized storage space or on storage rolls.

Folded or rolled items should be opened with care and gently, but firmly, held open with paper weights; very stiff and tightly rolled items may need to be relaxed before unrolling.

Large plans, maps, or any large paper sheets are preferably handled in Mylar pockets and are usually easily carried by diagonally opposite corners.

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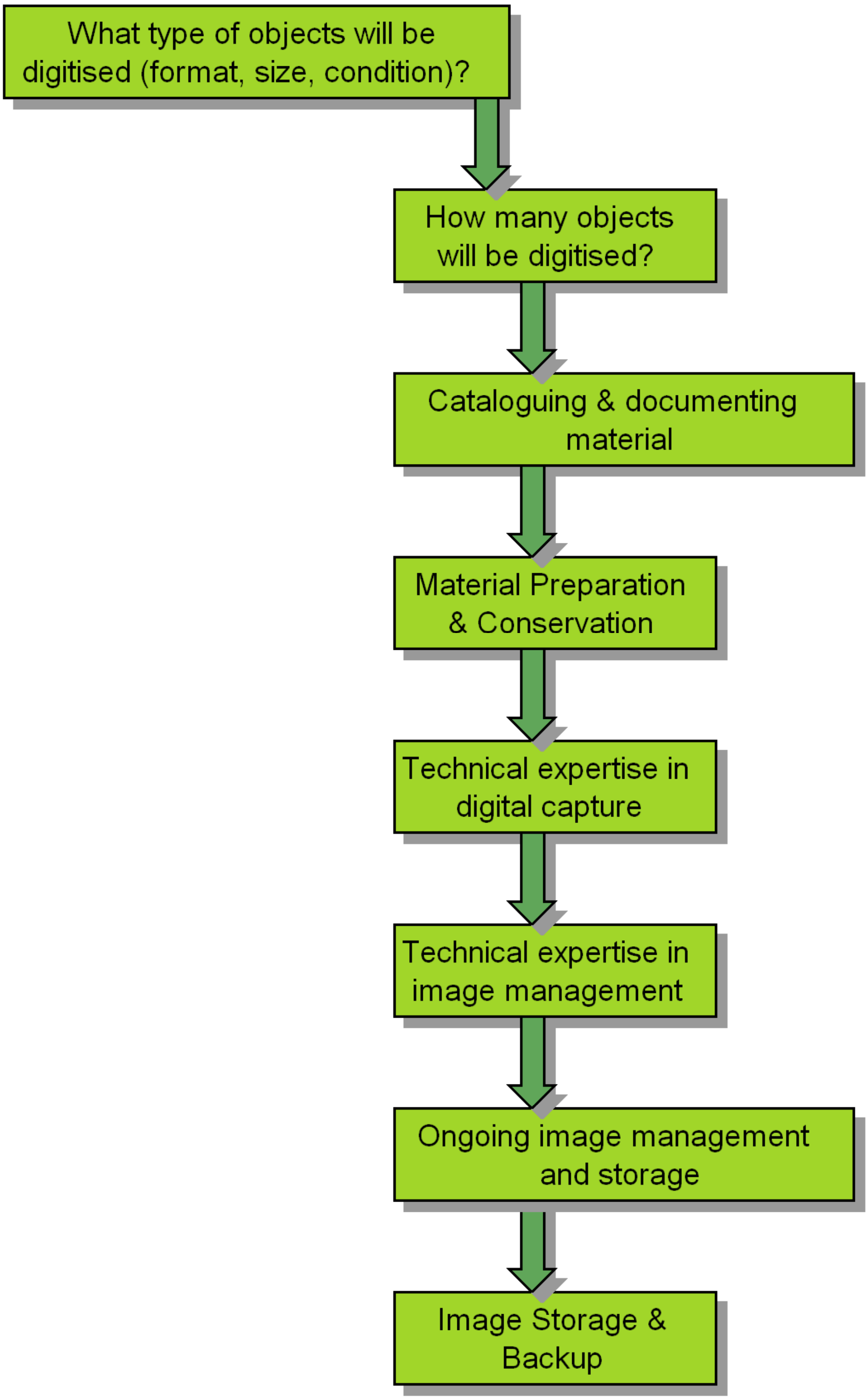
ASSESSING RESOURCES REQUIREMENTS


What type of objects will be digitised (format, size, condition)?
How many objects will be digitised?
Cataloguing & documenting material
Material Preparation & Conservation
Technical expertise in digital capture
Technical expertise in image management
Ongoing image management and storage
Image Storage & Backup

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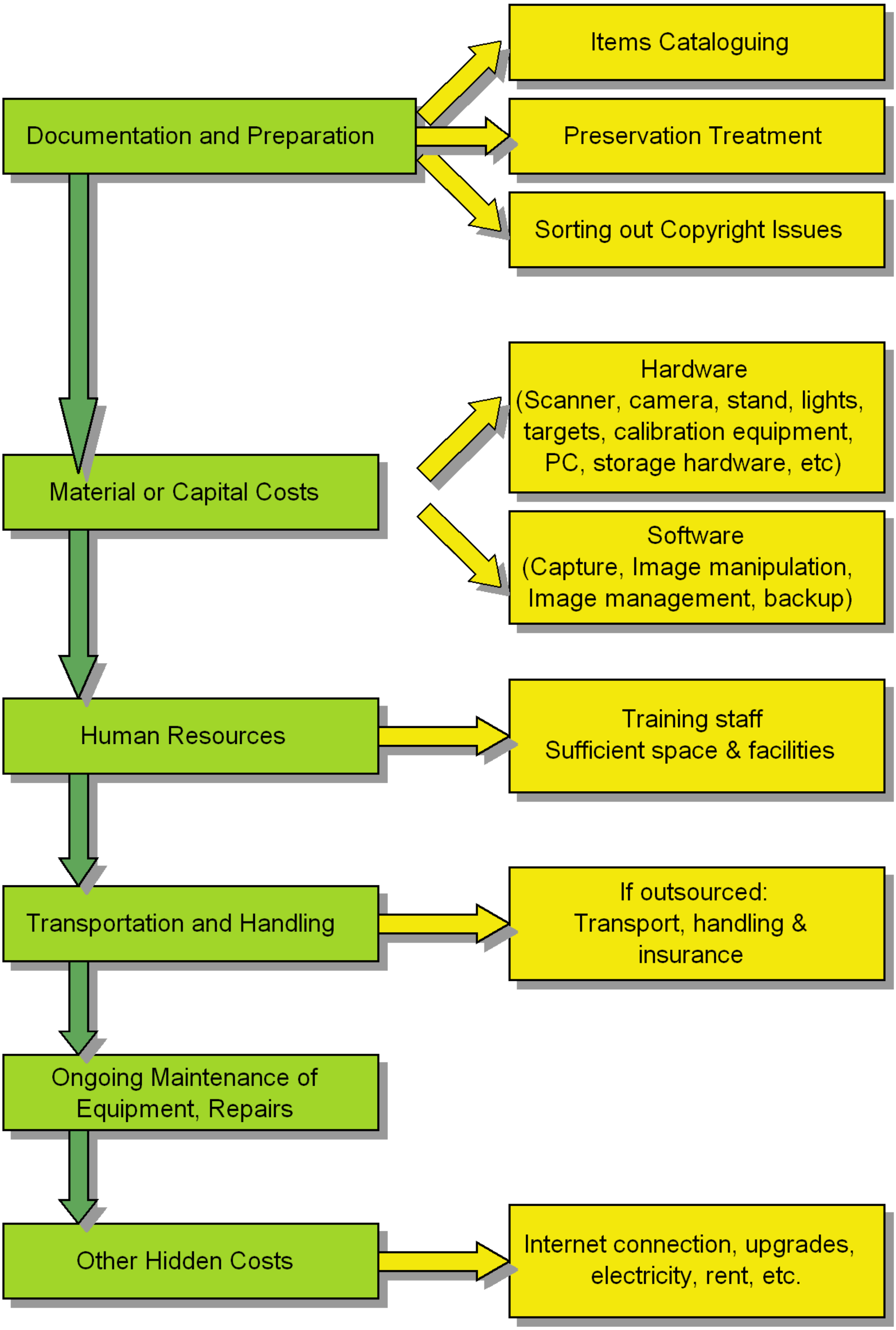
CALCULATING COSTS


Documentation and Preparation
Items Cataloguing
Preservation Treatment
Sorting out Copyright Issues
Material or Capital Costs
Hardware
(Scanner, camera, stand, lights, targets, calibration equipment, PC, storage hardware, etc)
Software
(Capture, Image manipulation, Image management, backup)
Human Resources
Training staff
Sufficient space & facilities
Transportation and Handling
If outsourced:
Transport, handling & insurance
Ongoing Maintenance of Equipment, Repairs
Other Hidden Costs
Internet connection, upgrades, electricity, rent, etc.

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CAPTURE YOUR COLLECTIONS: SMALL MUSEUM VERSION

a collaboration between

CHIN training and AMOL Australian Museums & Galleries Online

COSTS

COSTS TO CONSIDER DIGITISING INHOUSE VS CONTRACTING OUT
CONTRACTING OUT: FACTORS TO CONSIDER FINANCIAL ASSISTANCE EXERCISE

THIS MODULE WILL EXPLAIN:

- The variety of potential costs you should consider
- The benefits and pitfalls of in-house vs. contracting out services
- Who to contact for funding assistance for digitisation projects

COSTS TO CONSIDER

How much does it cost? This may be the first question you ask when the discussion turns to digitising your collection. The answer is that cost will depend upon many issues; the size of your institution and the collection, the number of 'scanning-ready' images already on hand, how well documented your images are and, of course, your defined requirements. There really is no 'one size fits all' solution.

Whether digitising in-house or contracting the work out, it is important to anticipate costs and budget for them. Among the various constituents of total cost for a digitisation project which should be considered are:

Documentation and preparation

- Photography and/or treatment of current photographs,
- Film processing and/or scanning,
- Image manipulation, i.e., adjusting images for their intended purpose
- Ensuring copyright status of images.

Material or capital costs, including:

- Hardware and software, (see more on Imaging Software in the Getting Started module) Scanning equipment, digital camera(s), (see more on Digital cameras in the Getting Started module) image manipulation software, (see more on Imaging Software in the Getting Started module)
- Equipment costs for image capture, digital image storage, and maintenance of digital images.

Human resources

- Hiring new or training existing staff and any staff turnover
- Sufficient space and facilities for equipment and any necessary new staff
- Training of staff to assist or oversee the movement of objects.

Transportation and handling

- Transportation and handling of objects to be photographed or images going to an outside sourced (mainly for two-dimensional objects - costs will be higher,

space needs may be greater and the logistics of artefact handling way be more complicated for three-dimensional objects)
- Insurance costs related to objects being transported off-site.

Ongoing maintenance of equipment
- Annual maintenance agreement with equipment or service provider

Other hidden costs
- Telephone line for data transfer, voltage controller (surge protector), LAN connections, and upgrades to workstations, possible treatment of objects.

As outlined in the Planning module, it may also be helpful to consider possibilities for cost sharing with another institution and pooling resources for equipment and/or staff costs. (see more on resources and reducing costs in the Planning module)

DIGITISING IMAGES INHOUSE VS. CONTRACTING OUT

When deciding on whether or not you can undertake a digitisation project one of the most important considerations is whether or not the project can be undertaken by staff using resources within the museum (in-house) or utilising local contractors, or indeed a mix of both. When deciding which route to take it is important to consider the following advantages and disadvantages:

	In-House	**Contracting Out**
Advantages	Learn by doing and develop in-house expertise Build production capability Retain control over all aspects of imaging Some flexibility in defined requirements Security of source material	Expertise and training of the digital service provider Set cost per image, prices can be negotiated based on volume which facilitates budget and project planning Lower labour costs Costs of technological obsolescence are absorbed by the digital service provider Limited risk Variety of options and services
Disadvantages	Larger investment No set price per image Need to set up technical infrastructure: space, digitisation equipment, computers Institution incurs costs of technological obsolescence Impact on other activities Institution pays for equipment, maintenance and personnel rather than for product Need for trained staff	Museum removed one step from imaging functions Possible inexperience with museum needs Quality control not on site Images will still need to be manipulated by museum staff. Random samples of the images produced should be conducted. Needs must be clearly defined in contract or there will be communication problems Transporting material – security and handling issues, especially with 3-D objects Vulnerability due to instability of digital service providers (companies in business for over two years are considered viable)

CONTRACTING OUT: FACTORS TO CONSIDER

Recognise that it is best not to send certain objects, such as the following, to commercial digital service providers:

- Original art works
- Fragile textiles
- Early printed materials
- Book-bindings - tooled book covers
- Large-format originals

If time is of the essence and you do not already have scanning facilities and trained staff available, you may wish to consider contracting some tasks out. However, a project that is contracted out will still require some training of staff who may still need to carry out preparation, documentation and object movement work etc.

For a short-term project, you may choose to use an outside digital service provider, as a trial, with a plan to review after the first phase. If you decide to contract out you must carefully define your needs to your digital service provider. Be clear about what you want, especially in terms of size and resolution. Whether you do your photography in-house or by contracting out, it is important you include grey- and colour-scales in each image. You must clearly outline the need for consistent results, and set benchmarks to check the quality of the digital images compared to both the original image and the original object. Be sure to include in the contract a clause outlining action you may take in case of poor quality output by your service provider.

You may also wish to share costs by pooling your expertise and funds with other museums interested in digitising their collection. To successfully achieve this kind of collaboration you will need to ensure you can agree on a set of imaging standards and deadlines.

If you are seeking a commercial service, you might use the following table to get an idea of the cost of scanning your materials. You should ask for their prices for the following:

Formats	1200 dpi 8 bit	300 dpi 24 bit	600 dpi 24 bit	1200 dpi 24 bit
35 mm slide	X	X	X	▨
35 mm negative	X	X	X	▨
Other transparency	X	X	▨	▨
Photographic prints	X	▨	▨	X
Printed materials	▨	X	X	X
Glass slides and plates	▨	▨	X	X
Other				

It is also worth noting that the majority of digitisation projects use a combination of in-house and external contractors, who prefer to base themselves within the museum. Sometimes arrangements can be made with photographic contractors to set up a temporary studio in the museum so there will be no need to remove objects from your premises. If this is an option you will need to make sure your museum insurance, or the contractor’s insurance, covers them for injury and theft or damage to equipment. Another issue to consider is the security and access to photographic equipment. Will the studio need to be packed up every day, or can it be housed in a secure area. If you have a large photographic collection, complete with its own cataloguing and filing system, it again may be easier for a contract scanner to set up temporarily in your museum. Again you will need to think about insurance.

These kinds of arrangements are contingent on having sufficient space and have the added benefit of allowing museum staff to supervise object handling. However, you will need to consider which staff will be able to assist and ensure they are available whenever the contractor may need them. Or alternatively arrange for the contractor to be on the premises only when you have sufficient staff.

FINANCIAL ASSISTANCE FOR DIGITISATION PROJECTS

Whilst there are a limited number of grants specifically for digitisation projects, there are a wide variety of grants and agencies who in the past have been willing to accept submissions that include staff, equipment and training for digitisation projects. The following details have been kindly supplied by the Museums and Galleries Foundation of New South Wales.

Funding Body	Title of Grant	Contact	Description	Eligibility	Closing date
Aboriginal and Torres Strait Islander Commission (ATSIC)	1) ATSIC National Art & Craft Industry Support Strategy 2) Regional funding sources 3) Heritage and Protection	Central Office P.O Box 17 Woden ACT 2606 tel: (02) 6121 4000 fax: (02) 6285 3009 www.atsic.gov.au	1) Assistance for community based art & craft centres to improve economic viability via development and/or support of a business plan. Also professional expertise available for critical periods. There is potential for some run-off funding for development of feasible new projects in poorly serviced and needy areas.	Organisations only in any state may apply. Aboriginal or Torres Strait Islander people only may apply.	November 2000
Australia Council	1) Community Cultural Development Fund 2) Visual Arts/Craft Fund 3) other funds include: Aboriginal & Torres Strait Islander Arts Fund, and New Media.	PO Box 788 Strawberry Hills NSW 2012 tel: (02) 9215 9000 toll free: 1800 226 912 toll free: 1800 659 291 www.ozco.gov.au	1) Supports cultural projects and creative community-based arts, including innovative partnerships which contribute to cultural development. 2.) Supports the creation, presentation and interpretation of contemporary Australian visual arts and craft.		Phone to inquire as there are different closing dates for each of the different funds. Request to be sent a *Support for the Arts Handbook*.
Australian National Maritime Museum	Maritime Museums of Australia Project Support Scheme (MMAPSS)	Ms Berri Shelley tel: (02) 9298 3743 fax: (02) 9298 3780 www.anmm.gov.au	To assist in the development of collecting, organising, preserving and communicating maritime collections. It provides grants of up to $5,000 for approved projects for either: collection management; conservation or presentation.	All maritime museums legally incorporated as non-profit-making bodies, whether privately or Government funded are eligible.	Applications due 14 July 2000.
National Library of Australia	Community Heritage Grants	National Initiatives & Collaboration Branch tel: (02) 6262 1147	To support community organisations preserve and improve access to		Applications due 16 June 2000

		fax: (02) 6273 4535 http://www.nla.gov.au/chg	documentary heritage collections of national significance.		
Local Council Heritage Small Grant and Loan Programs	64 NSW councils provide small grant or loans to assist heritage projects.	Contact your local council for further details.			
Museums and Galleries Foundation of NSW	Volunteer Initiated Museums (VIM) Grants Program	Museums and Galleries Foundation of NSW Regional Services Officers tel (02) 9358 1760	Grants of around $500 to support the work of volunteer initiated museums including: preventive conservation, consultancy fees, professional development and community liaison		7 April 2000 9 July 2000
NSW Ministry for the Arts	Cultural Grants including 1.) Museums Program 2.) Visual Arts and Crafts Program Other programs include: Capital Infrastructure Program, Community Cultural Development and Indigenous Arts Fund.	David Ellis, Museums Program Manager Debora Ely, Visual Arts Program Manager NSW Ministry for the Arts PO Box A226 Sydney South, NSW, 1235 tel: (02) 9228 5533 fax: (02) 02 9228 4722 freecall: 1800 358 594 email: ministry@ arts.nsw.gov.au	1.)Supports regional, community and theme-based museums and Aboriginal keeping places to undertake projects which will increase standards of practice. Funding categories are: Collections and Exhibitions; Salary Assistance and; Minor Capital works 2.) Visual Arts funding categories include: Program Costs; Staff Establishment Grants; Acquisitions and Commissioning Grants; Project Grants and; Public Art.	1.) Museums open to or planning to be open to the public 2.) Support available to non-profit organsiations and incorporated companies on a non-profit basis, local government and tertiary institutions for community-based projects. Also, see *Guidelines* for general eligibility criteria.	Phone for the copy of the *Guidelines: Cultural Grants, Fellowships, Scholarships and Awards* and application form. Applications will close: Museums Program Friday May 5 2000 Visual Arts & Crafts Program grants and Public Art: Friday 2 June 2000
Royal Australian Historical Society	1) Heritage Grant (funded by the NSW Heritage Office) 2) Cultural Grants (funded by the NSW Ministry for the Arts)	tel: (02) 9247 8001 fax: (02) 9247 7854 133 Macquarie St Sydney NSW 2000	1) To support the research and publication of local history, and the cataloguing, interpretation and conservation of archives concerning the heritage of NSW. 2) To support local history research and publication projects.		1) March 2000 2) May/June 2000
Tourism NSW	Regional Flagship Events Program	tel: (02) 9931 1565 fax: (02) 9931 1490	To assist events which express and contribute to the unique character of a region, and can draw in significant tourists from outside the region.		Phone to inquire
Australian Multicultural Foundation		tel: (03) 9347 6622	To promote a strong commitment to Australia from people drawn from many cultures.	Project must be of national significance and benefit a wide cross-	Applications for 2000 will be considered from July 1 2000

				section of Australians.	
George Alexander Foundation		Executive Secretary tel: (03) 9650 3188 http://www.gafoundation.org.au	The Foundation has a special interest in helping young people, especially those experiencing social or economic disadvantage, to achieve educational and employment goals. Conservation of the environment is another area of funding.	Grants for public charitable purposes in Australia.	Closing dates for applications are the first working days of February, May, August and November 2000.
Gordon Darling Foundation		tel: (03)9820 3168	Funding available to public institutions promoting the visual arts for special projects of an innovative nature - acquisitions, catalogues, commissions, exhibitions, publications, etc - when they are of special local relevance or are of Australia wide importance. The foundation also supports 'visionary' projects that might not otherwise receive funding.	Applications must be supported or recommended by a public institution.	End of January, May & September annually.
Holmes a Court Foundation		tel: (09) 322 4331	Grants available for projects and organisations in the arts, education & Aboriginal arts.	Not available to individuals	Phone to inquire
Ian Potter Foundation		The Executive Secretary 3rd floor 111 Collins St Melbourne VIC 3000 tel: (03) 9650 3188 fax: (03) 9650 7986 Email: admin@ianpotter.org.au www.ianpotter.org.au	Focus on the arts, education and research.		1st of February, May, August & November 2000.

EXERCISE

The following exercise will help you estimate the time and likely staff and equipment costs, involved in your digitisation project. Most importantly it should help you determine whether or not you can afford to hire new staff or bring in a contractor. To make best use of this exercise you will need to also find out how much contractors may charge per hour. At the same time you may wish to work out an hourly cost for your own staff, as sometimes their limited time may be better spent on other projects.

Potential Costs

A) Selecting Materials
Try to estimate how much time you think your own staff, or a contractor might take to complete each of the following tasks. You may also wish to assign an hourly cost to this work.

A) Image and copyright assessment

- Identifying images
- Determining legal restrictions (copyright, donor rights, etc.)
- Investigating the availability of digital and other versions of the image
- Determining the available documentation for the objects and images

Name/Title
hours __________ at $ ________ /hour

B) Object preparation and movement

- Retrieving and preparing objects for Photography
- Curator/Photographer to determine set-up needs
- Curator/Conservator to determine suitability of 2D or 3D objects for direct digital capture (scanning directly)

Name/Title
hours __________ at _________ /hour

C) Preparing images or objects for scanning or photographing

- Assessing Image attributes to determine scanning requirements (resolution, bit depth, enhancements, file format, compression)
- Confirm results by scanning a sample of images (if inhouse)
- Creating documentation/instructions for scanning
- Retrieving images from storage
- Checking the information associated with the images
- Recording the physical condition of the image
- Preparing (cleaning transparencies, disbanding, removing staples or otherwise preparing documents)

Name/Title
hours __________ at $ _________ /hour

D) Cataloguing and transportation

- Preparing inventories for contractor
- Arranging shipping and insurance
- Creating catalogue entries for images lacking good documentation

Name/Title
hours __________ at $_________ /hour

E) Imaging/Photography

- Time and expertise to set-up imaging station/ photographic studio
- Photography/scanning

Name/Title
hours __________ at _________ /hour

F) Quality control and storage

- Perform on-screen inspection
- Accuracy of file naming

- Corrections where necessary
- Loading digital files
- On –going maintenance of the database

Name/Title
hours __________ at $_________ /hour

G) Other costs

- Equipment: hardware and software
- Scanner, digital cameras, computer, storage media
- Equipment for archiving / migration
- Printers
- Renovation costs (if necessary) for appropriate space
- New telephone lines/cable for internet access

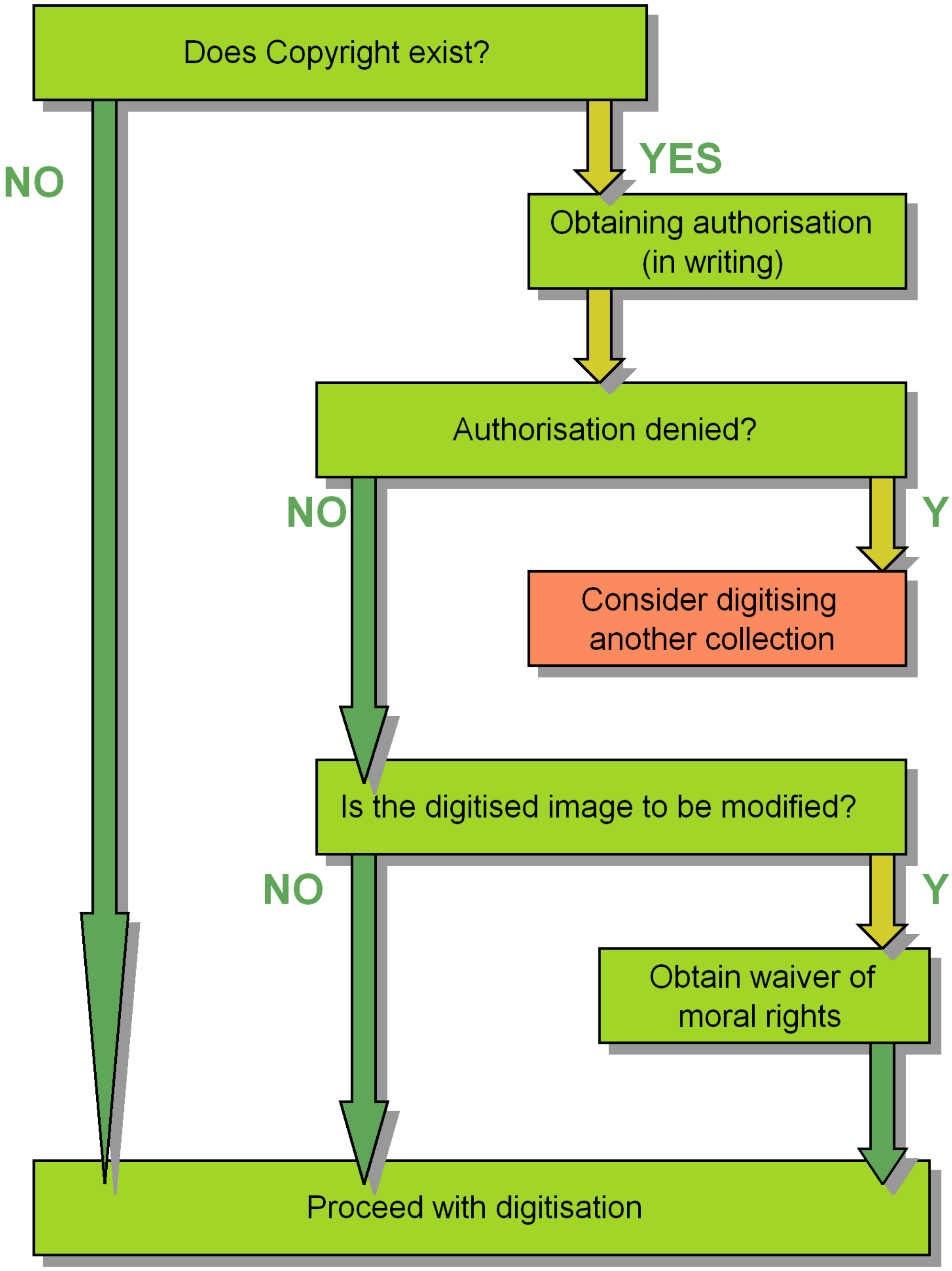
Adapted from RLG Worksheet for calculating costs

Do you understand:

- The costs you will need to consider before starting your project?
- The advantages and disadvantages of digitising images in house?
- The advantages and disadvantages of contracting out part or all of the project?
- Who you can approach for support and grants to help you digitise?

LEGAL ISSUES

Understand Copyright Law in your country



Does Copyright exist?

NO

YES

Obtaining authorisation (in writing)

Authorisation denied?

NO

YES

Consider digitising another collection

Is the digitised image to be modified?

NO

YES

Obtain waiver of moral rights

Proceed with digitisation

CAPTURE YOUR COLLECTIONS: SMALL MUSEUM VERSION

a collaboration between

CHIN training and AMOL Australian Museums & Galleries Online

LEGAL ISSUES

INTRODUCTION & DISCLAIMER   CANADIAN COPYRIGHT LAW 101 & AUSTRALIAN COPYRIGHT LAW
COPYRIGHT LICENCE   LEGAL PROTECTIONS AVAILABLE FOR DIGITISED IMIAGES   DIGITAL WATERMARKING

THIS MODULE WILL EXPLAIN:

- How Canadian and Australian copyright legislation affects digitisation projects
- How to go about attaining copyright clearance
- What “Rules of Use” are
- What digital watermarking is

INTRODUCTION & DISCLAIMER

The purpose of this module is to examine the legal issues surrounding the reproduction and digitisation of heritage content. In particular, it will focus on the law pertaining to copyright of digital photographs. However it is important to note that this module does not examine the law pertaining to the exhibition, transmission or communication to the public of digital images.

This module is written from the Australian and Canadian perspective and provides only general information. Neither the Canadian Heritage Information Network (CHIN) or Australian Museums On Line (AMOL) seek to provide legal advice through it. If such advice is required it is strongly recommended that the services of a competent professional, licensed to practice law in your jurisdiction should be sought. The governments of Canada and Australia assume no liability whatsoever with respect to actions that may arise as a consequence of using this guide, either by negligence or otherwise. As such it is important for you to understand that any statements contained herein should not be construed as being either the official or unofficial policy or statement of legal position of any entity of the government of Canada or Australia. They are simply broad guidelines.

CANADIAN COPYRIGHT LAW 101 & AUSTRLIAN COPYRIGHT LAW

Copyright protects the expression of ideas that are fixed in any media. It also protects the majority of creations, including literary, dramatic, musical and artistic works, sound recordings and audio-visual works. Ordinarily photographs are considered to be artistic works and thus the author (photographer) is the copyright holder. However this may not be the case where works are created in the course of an employee's duties or where copyright has been assigned in writing to someone else.

Further information on Canadian rights, exceptions to copyright, rights management and protection technologies is available within the online version of the course.

Further information on Australian Copyright legislation and how it may impact on your digitisation project is available within the online version of this course.

COPYRIGHT LICENCE

Before you digitise a work in your collection, it is advisable to determine first whether you have the right to make the digital reproduction. It is important to note that just because you may legally own an artwork, object, or photograph and have a donor receipt, this does not necessarily mean you own copyright. The same can be said of object loaned or copies of objects that you may have in your collection. Because they are in your collection does not necessarily mean you own copyright to images of them.

Below is a basic checklist that will assist in obtaining the appropriate clearances. It is by no means exhaustive, and proper legal counsel should be consulted to ensure that you hold all appropriate clearances before reproducing the work, or the photograph of the work or compiling it into a database.

Appropriate Copyright Clearances

1. Does copyright exist:
The duration of copyright protection can differ from country to country. In Canada and Australia, for instance, the general rule is that copyright protection runs for the life of the author plus 50 years. In the United States and the European Union, copyright protection runs for the life of the author plus 70 years. It is also important to note that the laws of the country in which the copyrighted work was created, should always be used to determine its copyright status.

2. Where the underlying work to be photographed/digitised is still protected by copyright:
Before photographing and digitising an image for which copyright is still in existence, a museum should ensure that the work being photographed and then digitised has been licensed for reproduction. Authorisations (in writing in Australia) should be obtained from the artist/creator of the work that is to be photographed. The authorisation should include the purpose for reproduction, length of authorisation and number of copies required. In Canada where the work at issue falls in the public domain (i.e. where the copyright no longer exists), then these authorisations are no longer needed. For a comprehensive discussion, see CHIN's publication, Checklist for Licensing Museum Images, available on line or for purchase in hard copy from CHIN. In Australia from 4 March 2001 higher civil damages and criminal penalties will be incurred where digitisation is a factor in the infringement.

3. Where the photograph is still protected by copyright:
Since the digitisation of an existing photograph is a reproduction, museums should also ensure that they hold the rights to digitise the photograph. Such rights can be obtained in two ways: by ensuring that the museum holds the copyright in the photograph through an agreement with the photographer or by negotiating these rights when the photograph is being subsequently digitised.

It is recommended that the right to reproduce the photograph be expressly negotiated with the photographer at the outset, preferably in his/her freelance contract. According to both Australian and Canadian law, any rights to reproduce the photograph must be assigned by the photographer in writing. Where staff members of the institution are photographing the work, that is, in-house in the course of their employment, then pursuant to Canadian law, copyright in the photograph belongs to the heritage institution. Where the photograph being digitised falls into the public domain, then authorisation is no longer needed.

4. Where the digitised image will be modified:
Where, in the course of digitisation, the image is somehow modified -- either cropped or discoloured -- rights associated with copyright, such as moral rights, will be an issue in Canada and soon in Australia. If you are considering the manipulation or coloration of images, you should consider obtaining a waiver of moral rights from the author of the image and any of the underlying works. If the author(s) does not wish to grant the waiver, consider allowing the author to pre-approve any reasonable changes to a work. For example, if an image of a work is being cropped or reduced in the course of developing a Web site or virtual exhibition, the author may want to approve such changes in order to protect the integrity of his or her work. In this case, the author will probably retain the right to review the use of his/her work and provide a waiver in writing after being satisfied that the work has not been mutilated, manipulated or "destroyed" to his/her prejudice. If the work that is the subject of the image or the photograph that is being digitised falls in the public domain, then the moral rights of the artist/creator or photographer are no longer an issue.

LEGAL PROTECTIONS AVAILABLE FOR DIGITSED IMAGES

As a matter of course, all digitised images that are copyright protected should have a copyright notice displayed somewhere on the image or below it, to remind the viewer of the work's copyright status. Such notices commonly take the following form:

Copyright © 2001, Name of Copyright Holder. All Rights Reserved.

If you place your digitised image on the Internet or include it in a database where either a public or limited audience, such as via subscription, can view it, you may want to include Rules of Use for your images. Where copyright law may fall short, Rules of Use have become the common way of closing this legal gap. Rules of Use, appropriately placed between the home page and subsequent pages of a Web site or virtual exhibition, provide an implied contract with the visitor. In other words, if the visitor to the Web site has no choice but to scroll through the rules before continuing to browse through the Web site, then it is arguable that the visitor is bound by the rules as an implied contract. The argument is strengthened where a click-through button is provided so that the visitor can indicate whether he/she agrees or disagrees with the Rules of Use. If the visitor disagrees with the terms, access to the content on the Web site is denied.

It is highly recommended that Rules of Use be established for any Web site or virtual exhibition containing copyrighted digitised images. It is also recommended that the Rules of Use contain contractual provisions acknowledging copyright protection and conditions upon subsequent use or reproduction. For a thorough examination of Canadian Rules of Use, consult CHIN's publication, "Protecting Your Interests: A Legal Guide to Negotiating Web Site Development and Virtual Exhibition Agreements," available for purchase in hard copy from CHIN or online at www.chin.gc.ca/Resources/Publications/e_publications.html#INTELLEC

DIGITAL WATERMARKING (STENOGRAPHY)

If you intend using your digital images to produce high resolution (quality) images for a website or other digital products, you may wish to use specialised software to protect your image copyright. One of the most common ways to deter people copying your images without your permission is to add a digital watermark to the image. This kind of technology is particularly useful if you intend placing images of contemporary artworks on your website where you may be required to protect not only your own museum's copyright, but also the artist. Also called digital finger printing, watermarking allows you to encode a subtle or not so subtle mark within your digital file so that when copied the file cannot be altered or the mark removed. Depending on the technology used, this mark can include the name of the copyright owner or their logo, and the trick is to find a way to clearly indicate copyright ownership without impeding the legibility of the image. Be careful, digital watermarking software can be expensive and you need to carefully assess the real risk against the cost of implementing an effective solution.

Points to consider

- Do you hold copyright for objects and the images you plan to digitise?
- Have you consulted legal counsel regarding any issues pertaining to copyright on your objects or images?
- Are you aware of the moral issues related to cropping or otherwise altering images?
- Are you planning to put a “Rules of Use” statement on your electronic image database?
- Do your “Rules of Use” precede viewing images?

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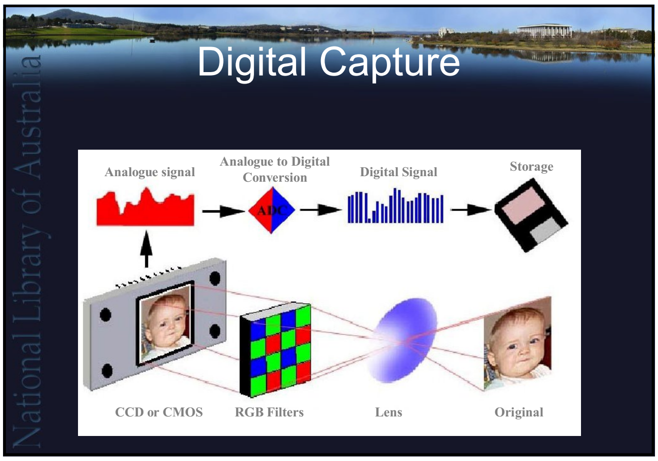
Introduction to Digital Imaging

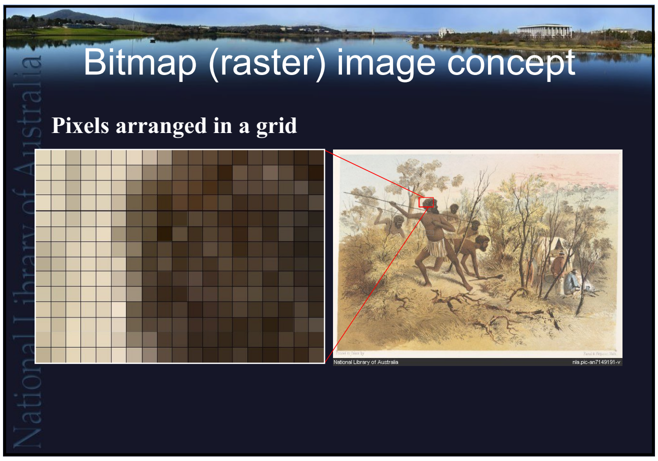
DOHM
Digitisation of Heritage Materials
National Library of Australia

National Library of Australia



Digital Capture

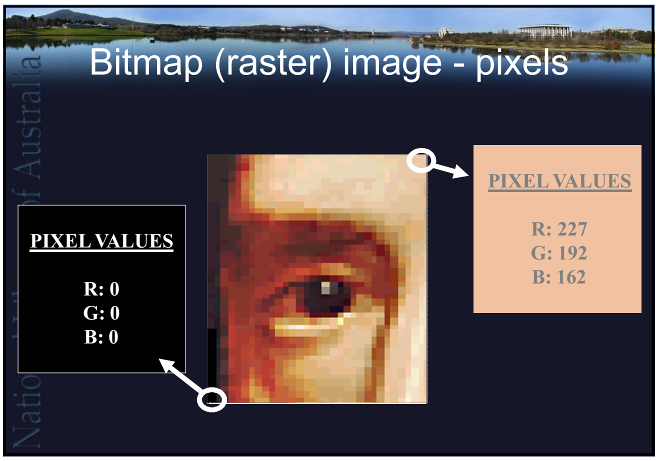
National Library of Australia



Bitmap (raster) image concept

Pixels arranged in a grid

National Library of Australia



Bitmap (raster) image - pixels

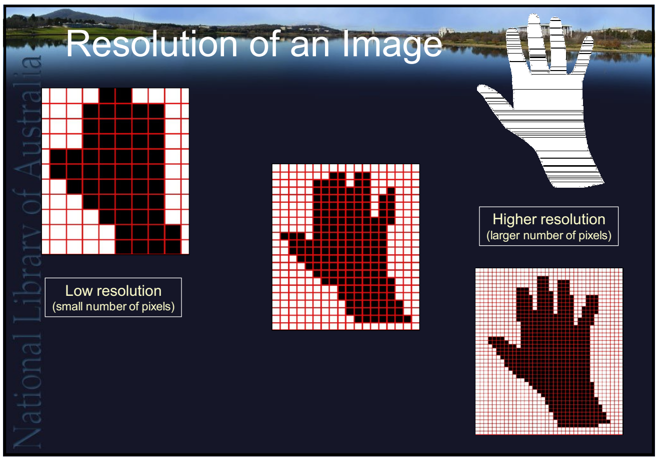
PIXEL VALUES

R: 0
G: 0
B: 0

PIXEL VALUES

R: 227
G: 192
B: 162

National Library of Australia



Resolution of an Image

Low resolution
(small number of pixels)

Higher resolution
(larger number of pixels)

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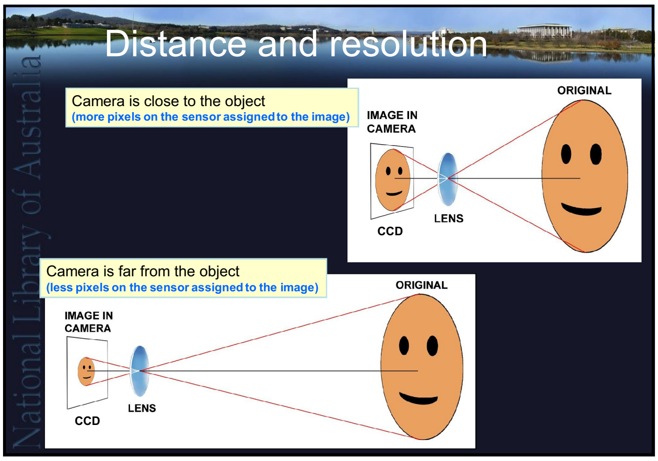

Distance and resolution

Camera is close to the object
(more pixels on the sensor assigned to the image)

Camera is far from the object
(less pixels on the sensor assigned to the image)

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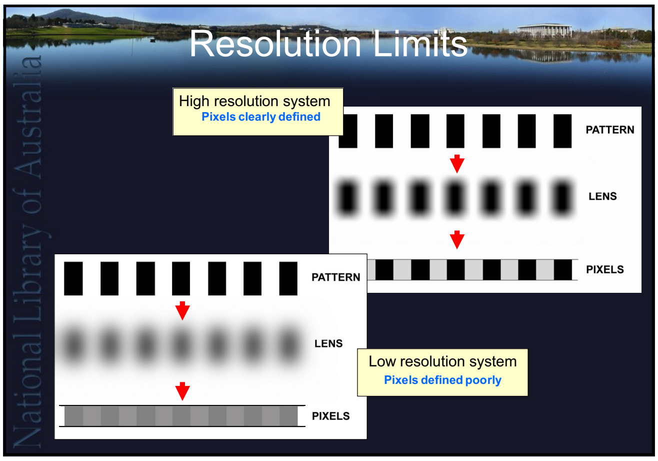
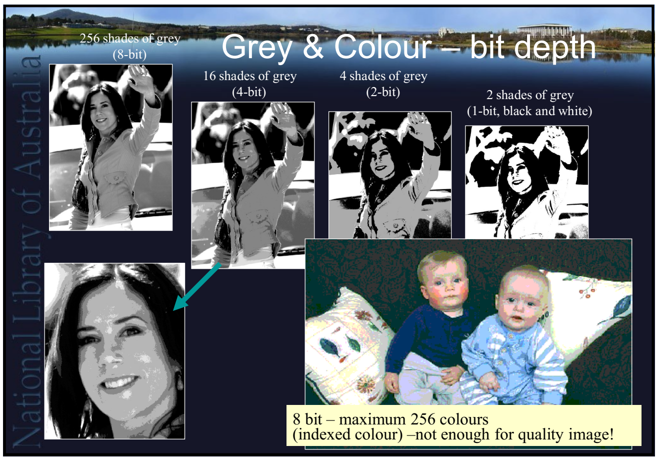


Resolution Limits

High resolution system
Pixels clearly defined

Low resolution system
Pixels defined poorly



Grey & Colour – bit depth

8 bit – maximum 256 colours
(indexed colour) –not enough for quality image!

Quality Digital Images

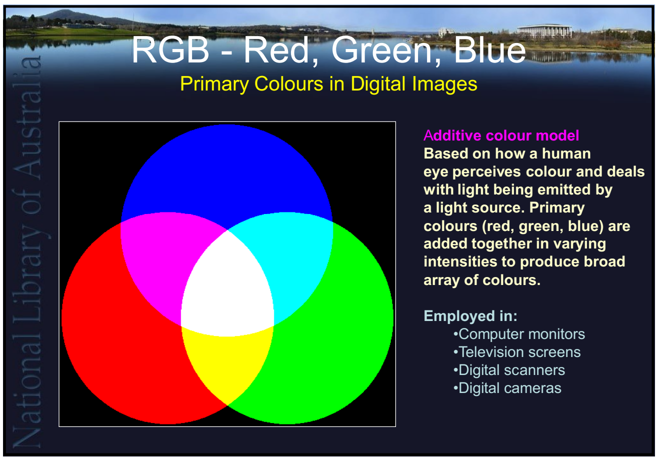
Suitable for archiving

Technically

Minimum - 24 bit (RGB) colour
OR
Minimum – 8-bit greyscale

Visually

- Over 16.7 million colours possible in the image (24-bit RGB)
- 256 shades of grey (greyscale)



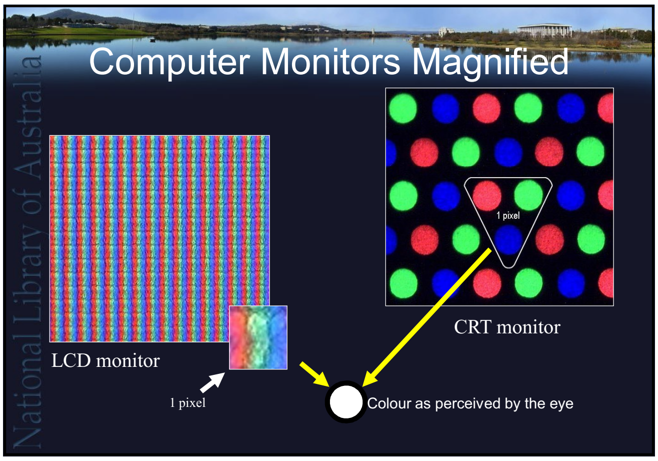
RGB - Red, Green, Blue

Primary Colours in Digital Images

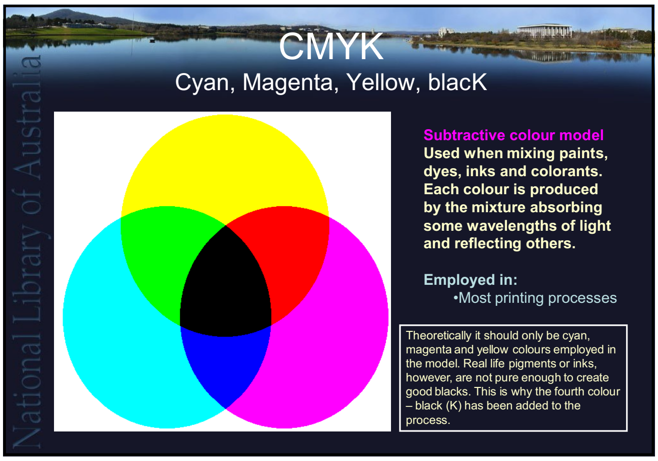
Additive colour model
Based on how a human eye perceives colour and deals with light being emitted by a light source. Primary colours (red, green, blue) are added together in varying intensities to produce broad array of colours.

Employed in:

- Computer monitors
- Television screens
- Digital scanners
- Digital cameras



Computer Monitors Magnified



CMYK

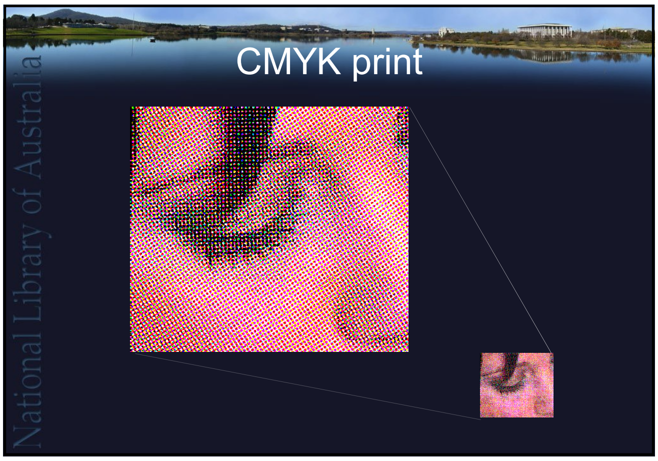
Cyan, Magenta, Yellow, blacK

Subtractive colour model
Used when mixing paints, dyes, inks and colorants. Each colour is produced by the mixture absorbing some wavelengths of light and reflecting others.

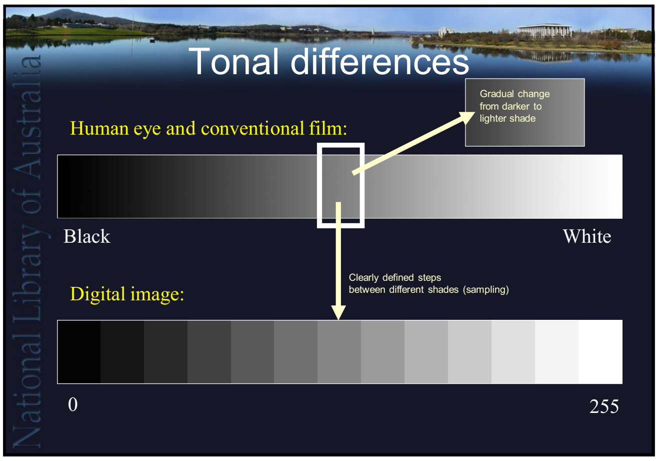
Employed in:

- Most printing processes

Theoretically it should only be cyan, magenta and yellow colours employed in the model. Real life pigments or inks, however, are not pure enough to create good blacks. This is why the fourth colour – black (K) has been added to the process.



CMYK print



Tonal differences

Human eye and conventional film:

Gradual change from darker to lighter shade

Black

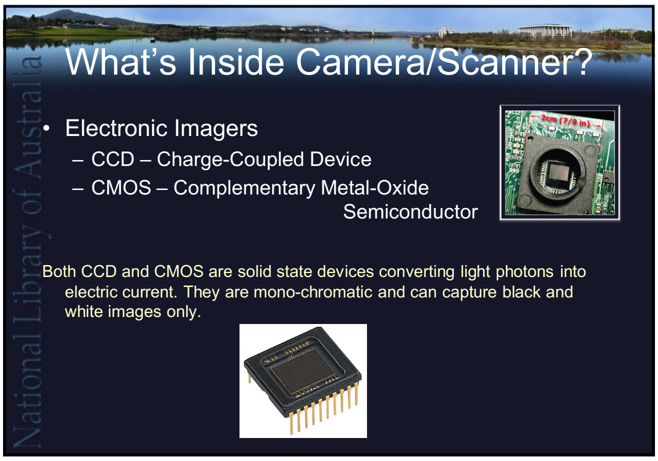
White

Clearly defined steps between different shades (sampling)

Digital image:

0

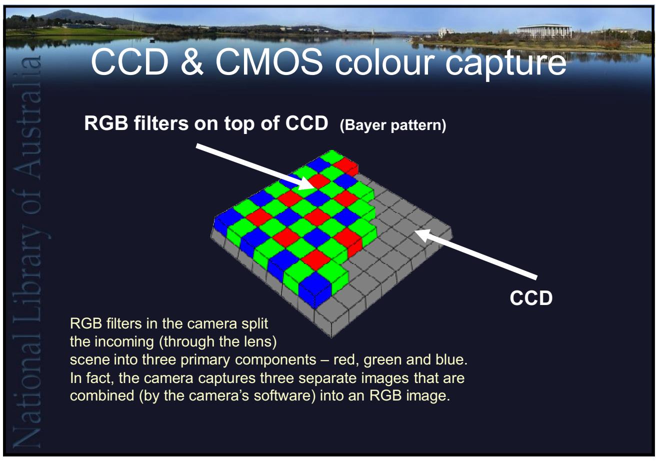
255



What’s Inside Camera/Scanner?

- Electronic Imagers
  - CCD – Charge-Coupled Device
  - CMOS – Complementary Metal-Oxide Semiconductor

Both CCD and CMOS are solid state devices converting light photons into electric current. They are mono-chromatic and can capture black and white images only.



CCD & CMOS colour capture

RGB filters on top of CCD **(Bayer pattern)**

CCD

RGB filters in the camera split the incoming (through the lens) scene into three primary components – red, green and blue. In fact, the camera captures three separate images that are combined (by the camera’s software) into an RGB image.

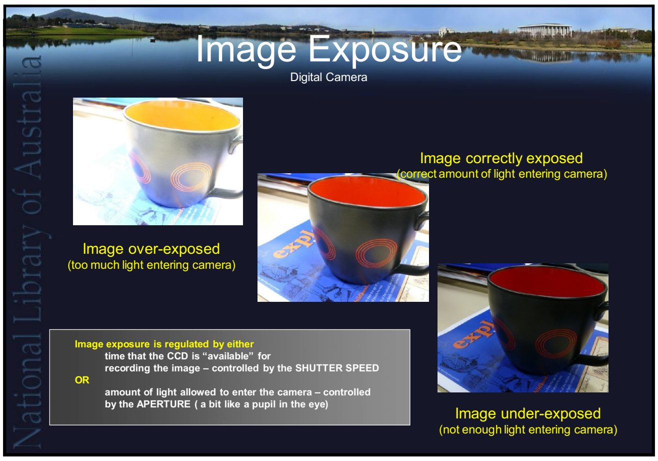


Image Exposure

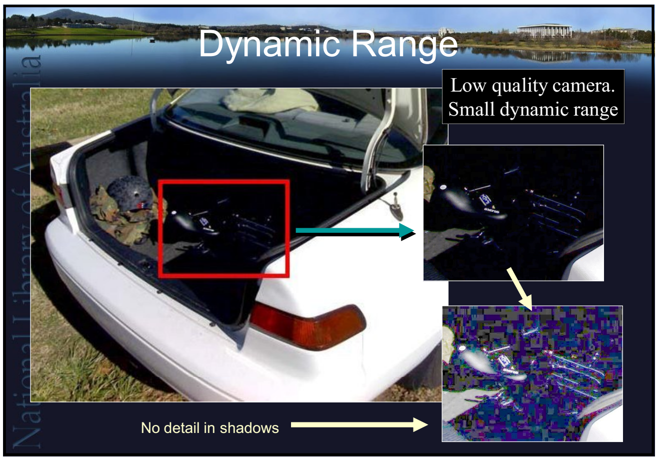
Digital Camera

Image over-exposed
(too much light entering camera)

Image correctly exposed
(correct amount of light entering camera)

Image under-exposed
(not enough light entering camera)

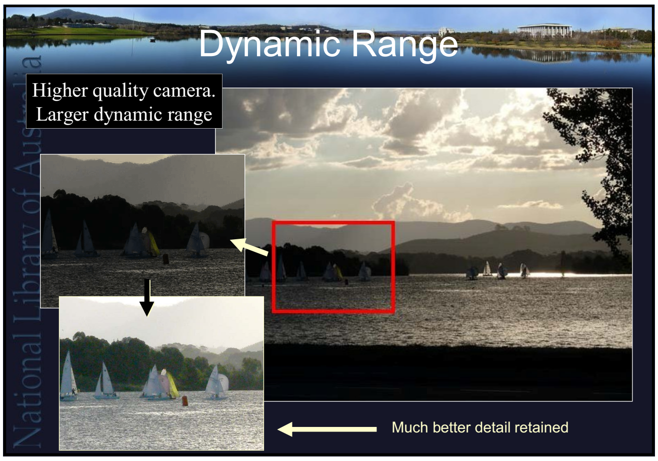
Image exposure is regulated by either
time that the CCD is “available” for recording the image – controlled by the SHUTTER SPEED
OR
amount of light allowed to enter the camera – controlled by the APERTURE (a bit like a pupil in the eye)



Dynamic Range

Low quality camera.
Small dynamic range

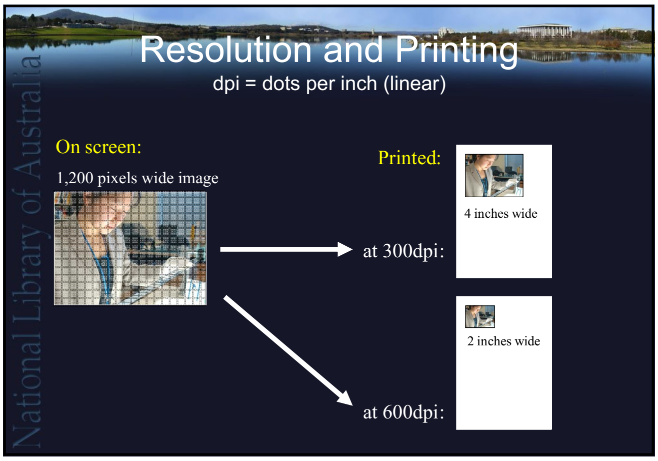
No detail in shadows



Dynamic Range

Higher quality camera.
Larger dynamic range

Much better detail retained



Resolution and Printing

dpi = dots per inch (linear)

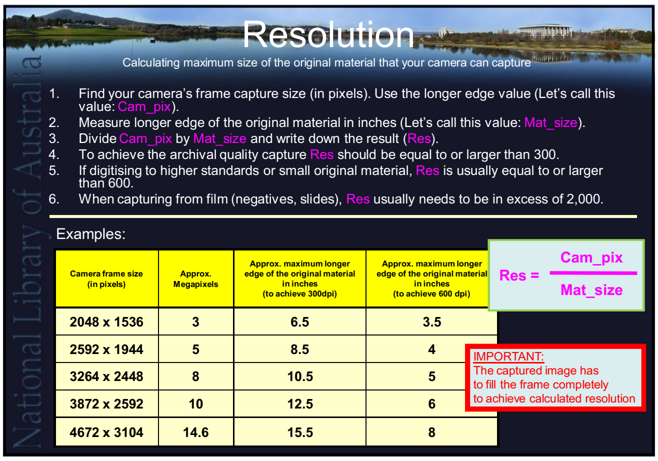
On screen:

1,200 pixels wide image

Printed:

at 300dpi:

at 600dpi: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Resolution

Calculating maximum size of the original material that your camera can capture

1. Find your camera's frame capture size (in pixels). Use the longer edge value (Let's call this value: Cam_pix).
2. Measure longer edge of the original material in inches (Let's call this value: Mat_size).
3. Divide Cam_pix by Mat_size and write down the result (Res).
4. To achieve the archival quality capture Res should be equal to or larger than 300.
5. If digitising to higher standards or small original material, Res is usually equal to or larger than 600.
6. When capturing from film (negatives, slides), Res usually needs to be in excess of 2,000.

Examples:

Camera frame size (in pixels)	Approx. Megapixels	Approx. maximum longer edge of the original material in inches (to achieve 300dpi)	Approx. maximum longer edge of the original material in inches (to achieve 600 dpi)
2048 x 1536	3	6.5	3.5
2592 x 1944	5	8.5	4
3264 x 2448	8	10.5	5
3872 x 2592	10	12.5	6
4672 x 3104	14.6	15.5	8

$$\text{Res} = \frac{\text{Cam\_pix}}{\text{Mat\_size}}$$

IMPORTANT:
The captured image has to fill the frame completely to achieve calculated resolution

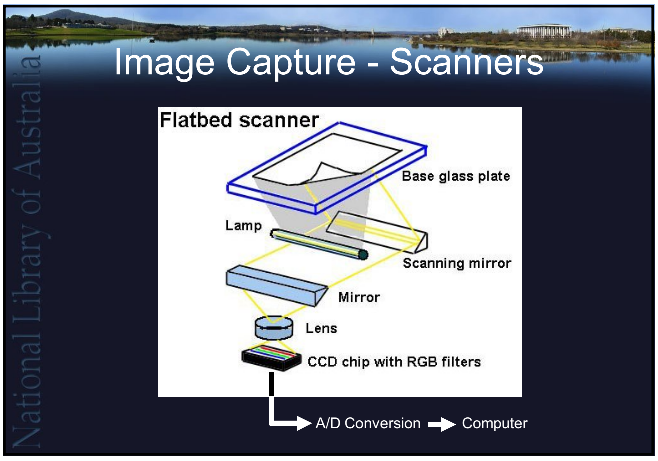
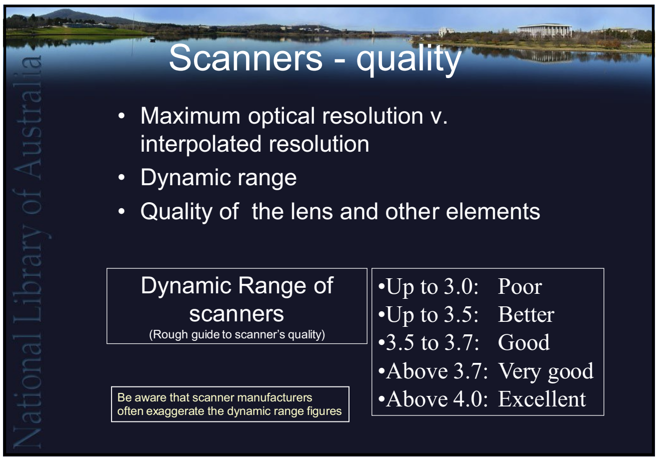


Image Capture - Scanners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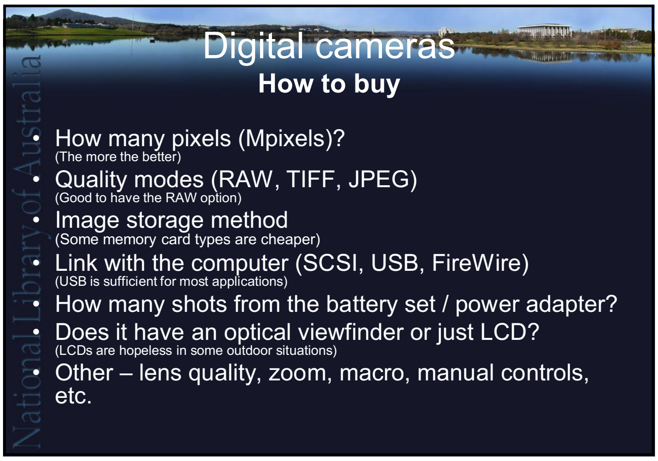
Scanners - quality

- Maximum optical resolution v. interpolated resolution
- Dynamic range
- Quality of the lens and other elements

Dynamic Range of scanners
(Rough guide to scanner's quality)

•Up to 3.0:	Poor
•Up to 3.5:	Better
•3.5 to 3.7:	Good
•Above 3.7:	Very good
•Above 4.0:	Excellent

Be aware that scanner manufacturers often exaggerate the dynamic range figures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Digital cameras

How to buy

- How many pixels (Mpixels)?
  (The more the better)
- Quality modes (RAW, TIFF, JPEG)
  (Good to have the RAW option)
- Image storage method
  (Some memory card types are cheaper)
- Link with the computer (SCSI, USB, FireWire)
  (USB is sufficient for most applications)
- How many shots from the battery set / power adapter?
- Does it have an optical viewfinder or just LCD?
  (LCDs are hopeless in some outdoor situations)
- Other – lens quality, zoom, macro, manual controls, etc.

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Digital Capture

- Colour calibration of devices and computers
- Adequate lighting for the camera
- Adequate capture resolution
- Proper handling of materials

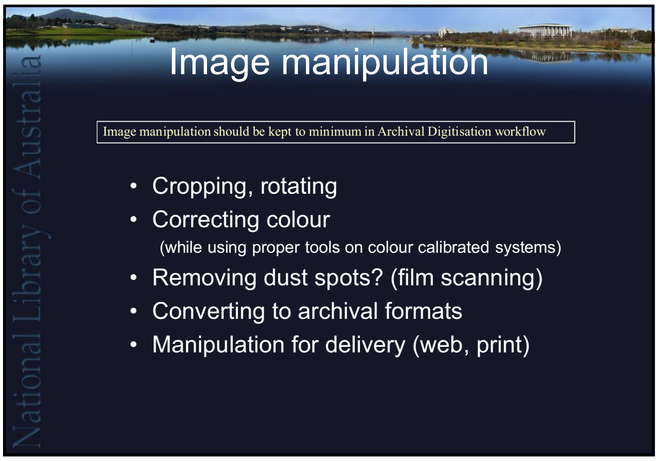
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Image manipulation

Image manipulation should be kept to minimum in Archival Digitisation workflow

- Cropping, rotating
- Correcting colour
  (while using proper tools on colour calibrated systems)
- Removing dust spots? (film scanning)
- Converting to archival formats
- Manipulation for delivery (web, print)

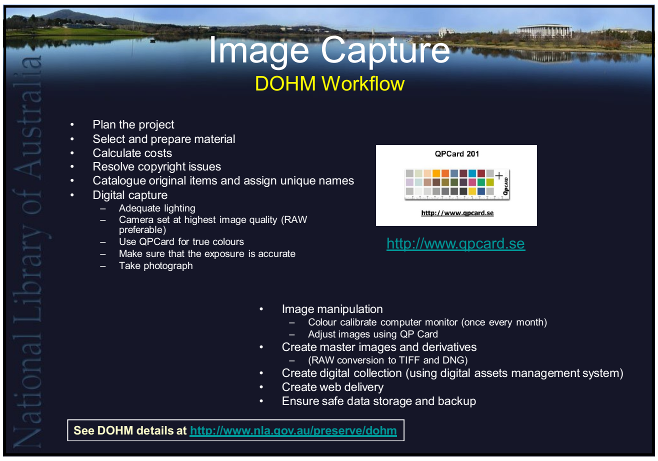
National Library of Australia
QPCard 201
http://www.qpcard.se

Image Capture

DOHM Workflow

- Plan the project
- Select and prepare material
- Calculate costs
- Resolve copyright issues
- Catalogue original items and assign unique names
- Digital capture
  - Adequate lighting
  - Camera set at highest image quality (RAW preferable)
  - Use QPCard for true colours
  - Make sure that the exposure is accurate
  - Take photograph

http://www.qpcard.se

- Image manipulation
  - Colour calibrate computer monitor (once every month)
  - Adjust images using QP Card
- Create master images and derivatives
  - (RAW conversion to TIFF and DNG)
- Create digital collection (using digital assets management system)
- Create web delivery
- Ensure safe data storage and backup

See DOHM details at http://www.nla.gov.au/preserve/dohm

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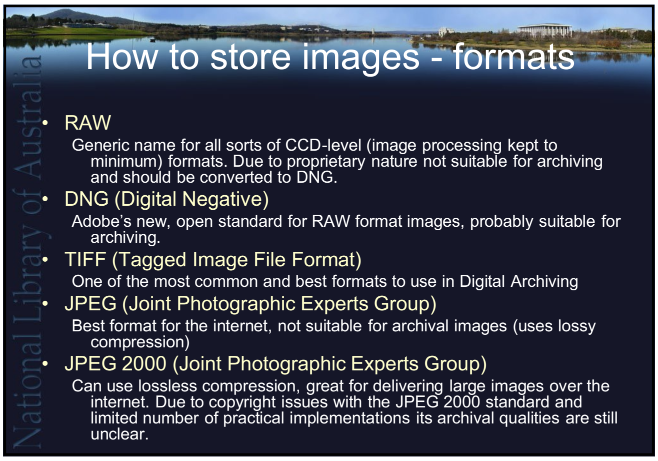
How to store images - media

- Internal & External Hard Disk Drives
- CD-R (optical discs) – not recommended
  (will become obsolete soon; cumbersome and time-consuming to migrate data from)
- "Archival" Digital Tape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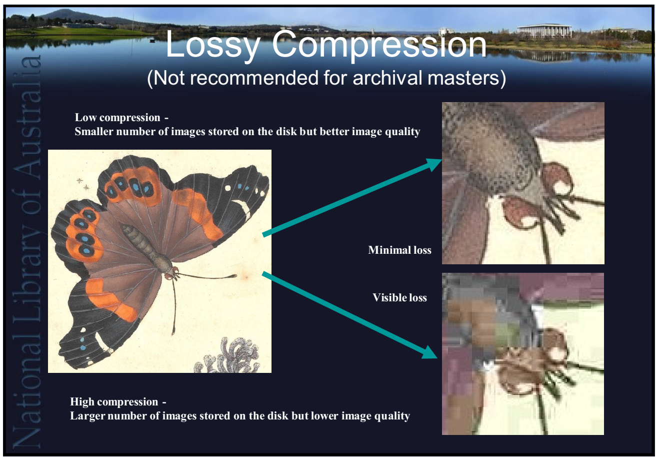
How to store images - formats

- RAW
  Generic name for all sorts of CCD-level (image processing kept to minimum) formats. Due to proprietary nature not suitable for archiving and should be converted to DNG.
- DNG (Digital Negative)
  Adobe's new, open standard for RAW format images, probably suitable for archiving.
- TIFF (Tagged Image File Format)
  One of the most common and best formats to use in Digital Archiving
- JPEG (Joint Photographic Experts Group)
  Best format for the internet, not suitable for archival images (uses lossy compression)
- JPEG 2000 (Joint Photographic Experts Group)
  Can use lossless compression, great for delivering large images over the internet. Due to copyright issues with the JPEG 2000 standard and limited number of practical implementations its archival qualities are still unclear.

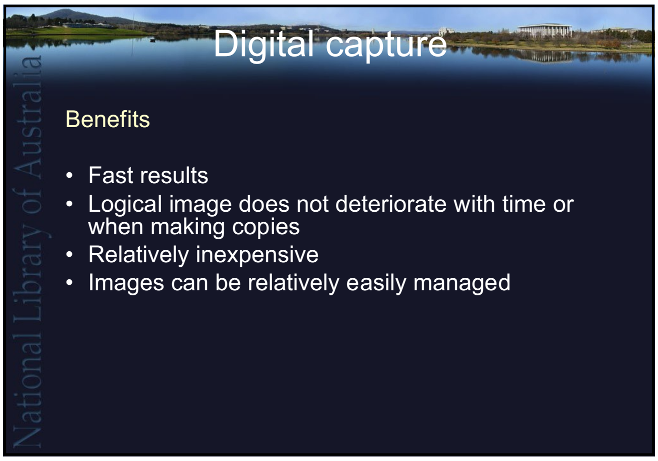


Lossy Compression

(Not recommended for archival masters)

Low compression -
Smaller number of images stored on the disk but better image quality

High compression -
Larger number of images stored on the disk but lower image quality



Digital capture

Benefits

- Fast results
- Logical image does not deteriorate with time or when making copies
- Relatively inexpensive
- Images can be relatively easily managed

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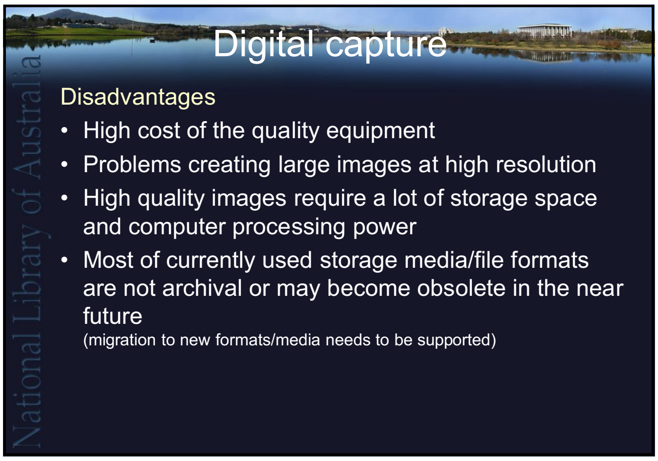

Digital capture

Disadvantages

- High cost of the quality equipment
- Problems creating large images at high resolution
- High quality images require a lot of storage space and computer processing power
- Most of currently used storage media/file formats are not archival or may become obsolete in the near future
  (migration to new formats/media needs to be supported)

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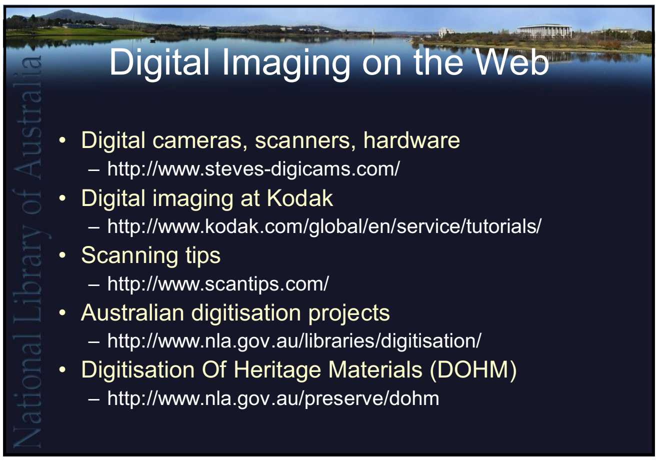

Digital Imaging on the Web

- Digital cameras, scanners, hardware
  - http://www.steves-digicams.com/
- Digital imaging at Kodak
  - http://www.kodak.com/global/en/service/tutorials/
- Scanning tips
  - http://www.scantips.com/
- Australian digitisation projects
  - http://www.nla.gov.au/libraries/digitisation/
- Digitisation Of Heritage Materials (DOHM)
  - http://www.nla.gov.au/preserve/dohm

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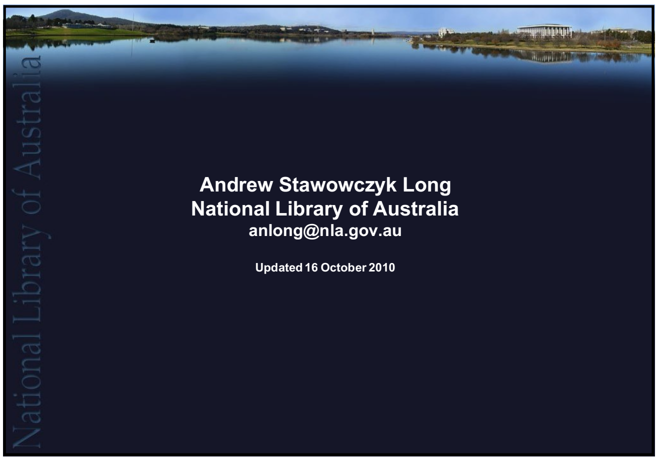

Andrew Stawowczyk Long
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anlong@nla.gov.au

Updated 16 October 2010

National Library of Australia

SELECTING HARDWARE & SOFTWARE

Adapted from AMOL's *CAPTURE YOUR COLLECTIONS: SMALL MUSEUM VERSION* online course. Updated October 2010.

It is easy to be overwhelmed by the wide selection of digital imaging hardware and software available. However there are many very successful examples of small scale digitisation projects that utilised very basic equipment to successfully digitise collections.

COMPUTERS

Operating system. The most popular operating systems for stand-alone systems are Microsoft Windows and Macintosh OS; UNIX is the most common for networked workstations. Increasingly popular are various flavours of Linux, with Ubuntu probably being the best known. Consideration must be given to your institution's current platform.

Processor. Image manipulation software requires substantial computing power. The faster the processor, the more efficient the image manipulation process. The processor should be a recent model to ensure that current image software can run on it and that it will accommodate intensive image editing. Multiple and multi-core processors would also speed up processing, providing that the software is capable of utilising them.

Memory, also referred to as Random Access Memory or RAM. Advanced imaging software applications normally require three times the image file size; therefore, 30- MB image files require 90 MB of memory. More memory may be required if additional software is used simultaneously. Complex image operations will tend to increase the amount of RAM required. We recommend at least 2Gb of RAM, preferably more.

Hard disk space. Allow space not only for the imaging software but also for its working files, work in progress and an accumulation of images. Disk space requirements can be substantial, depending on the image archival process used. We recommend at least 1Tb SATA HDD.

Display monitor. This is a key part of the system for image processing and verification. Monitors should be as large as possible, be capable of displaying at least 24-bit colour (16.8 million colours), and have a graphic card with sufficient memory. High-quality images are often captured at a level that is beyond the capability of the display monitors; therefore, the most advanced display technology should be used, consisting of large monitors (21" or better), and 24-bit display with a corresponding graphic card. The cheaper LCD (flat), consumer-class monitors are not the best choice as they have many limitations. Only more expensive LCDs are regarded as suitable for serious, professional digitisation.

Archival drive/storage. Required for archiving and backups. The drive/storage should be an external Hard Disk Drive (HDD), archival tape or CD/DVD if the previous options are impractical (but CD/DVD option is not recommended). Alternatively, files may be written to a network drive (requires workstation connected to a network drive).

SCANNERS

Flatbed scanner. The most popular image capture device for flat objects, the flatbed scanner can be used to capture non-transparent objects and transparent materials such as 35-mm slides unless the quantity of transparent materials warrants a separate film scanner. The following are some of the features to consider:

Desirable Features

Resolution: Minimum resolution of 600 dpi. Higher resolution (2000-3000dpi) recommended if used to scan film transparencies and negatives.
Bit depth: Minimum of 36 bits, but 48 bits or higher recommended (and commonly available).
USB interface: For plug-and-play operation.
Transparent media adapter: For scanning transparent materials, if required. Generally, most flatbed scanners are not suitable for scanning transparent material (results are substandard).
Film scanner: Dedicated film scanners may be required if large quantities of transparent materials are to be scanned. Although more expensive than a flatbed scanner, a film scanner will generate a higher quality image because its scanning process is specific to this medium. Although expensive, a film or slide scanner will produce the highest quality digital images. Some film scanners are capable of capturing larger transparency formats, thus producing very high quality digital images. An alternative to a film scanner is a flatbed scanner with a transparency media adapter (TMA). This method will not produce as high a quality a product as the film scanner, but may be sufficient for your needs. The following are some of the features to consider:

Feature/issue Desirable
Resolution: Minimum resolution of 2000 dpi.
Bit depth: Minimum of 48 bits or higher recommended (commonly available).
USB or FireWire interface: For plug-and-play operation.

DIGITAL CAMERAS

Digital cameras can be used in the same way as film cameras, eliminating the need for film processing and creating immediate digital images that can be reviewed as soon as they are created. High-end digital cameras are more expensive than flatbed scanners. Like traditional film cameras, digital cameras can be used in different settings, although they are limited in the number of pictures that can be captured at one time because of the large image file sizes required for high-quality purposes. Digital cameras also require intense light sources in a studio setting, which may pose conservation problems for some objects. Increasingly, digital cameras are falling in price, whilst the quality of images they produce is steadily improving.

However, you still get what you pay for. If you spend a small amount of money you will get a camera capable of producing relatively low quality images. Whilst they may be suitable for a website, they may not be useful for archival purposes. When buying a digital camera the following are features to consider:

Desirable Features

Resolution: Only high-end digital cameras with a resolution of 10 million or more pixels should be considered for creating master images
Lens: Fast (f/3.5) zoom lens with macro capability, equivalent of 35mm to 105mm.
Sensitivity: Adjustable ISO sensitivity of 50/100/200/400
White balance modes: Manual
Other: Manual exposure, manual focus, RAW capability

Scanners and digital cameras can be used to capture many of the same formats such as prints, documents, large maps and even film slides or negatives. For some items, a digital camera may be more appropriate than a scanner, whereas a scanner may be better suited for capturing other objects

IMAGING SOFTWARE

Several types of freeware and shareware products are available on the Internet. Some of them are excellent products capable of assisting in production of high-quality images. Most professional digitisers, however, use Adobe PhotoShop for image manipulation.
During the image capture process, little or no image enhancements should be made to the master images created for archival purposes. This will ensure that the consistency of the image capture process is retained and will match the recorded information (metadata).

Imaging software should be able to handle all the necessary manipulation of images that is required. The following are some of the features to consider:

- Import and export file formats
- Convert image file formats
- Support ICC colour management workflows
- Operations such as cropping, brightness/contrast adjustment, resizing
- Multiple images open at a time
- Ability to handle large size images
- Multiple undo levels
- Batch and macro facilities for repeat operations
- Support for TWAIN or ISIS standards
- Save workspace settings to pick up work in progress where it was left off
- Built-in image management
- Cross platform operation

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CAPTURE YOUR COLLECTIONS: SMALLL MUSEUM VERSION

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FUNDAMENTALS

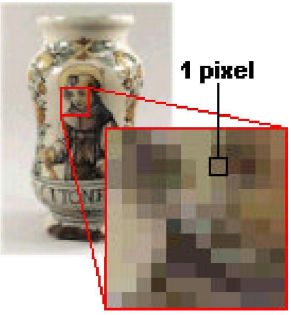
PIXELS & RESOLUTION BIT DEPTH FILES & FILE FORMATS EXERCISE

THIS MODULE WILL EXPLAIN:

- What is a digital image?
- What are the various types of images and how do they differ from each other?
- What is file compression?
- What digitisation equipment and resolution is appropriate for different collection items?

PIXELS & RESOLUTION

When digital technology is used to capture, store, modify and view photographic images, the images must first be converted to a set of numbers in a process called digitisation. Computers are very good at storing and manipulating numbers and can therefore handle digitised images with remarkable speed. Once digitised, photographs can be examined, altered, displayed, transmitted, printed or archived in an incredible variety of ways. As you explore digital imaging, it helps to be familiar with a few basic terms.



Digital images consist of a grid of small squares, known as picture elements, or pixels: These basic building blocks are the smallest elements used by computer monitors or printers to represent text, graphics, or images.

Resolution describes the clarity or level of detail of a digital image. Technically the term "resolution" refers to spatial resolution and brightness resolution; commonly, however, the word is used to refer to spatial resolution alone. The higher the resolution, the greater the detail in the image (and the larger the file). For computers and digital cameras, resolution is measured in pixels; for scanners, resolution is measured in pixels per inch (dpi) or dots per inch (ppi); for printers, resolution is measured in dots per inch (dpi).

300 DPI

150 DPI

60 DPI

30 DPI

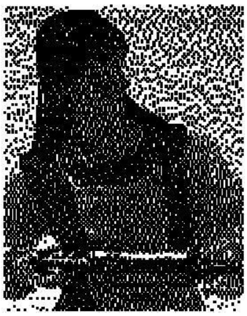
BIT DEPTH

Bit depth, sometimes called "brightness resolution", defines the number of possible tones or colours every pixel can have. The greater the bit depth, the greater the depth of colour, and the larger the colour (or greyscale) palette (number of colours). For example, 8-bit colour has a range of 256 colours (or shades of grey) and 24-bit (or higher) colour provides 16.7 million colours, but 30-bit colour has many more millions of colours, which offers higher definition and thus better results in reproducing details such as the shadowy parts of an image.

24 bit true colour

8 bit 256 colour

8 bit 256 greyscale


2 bit black & white

FILES & FILE FORMATS

Once you take a digital photograph or scan an image, the image becomes a digital file, which is stored on a computer like any other file. Image files tend to be larger than text files, since images require more data to represent visual information. The file size of an image (usually measured in megabytes, or MB) indicates the amount of data required to capture a specific image to a given level of resolution. Digital image files are stored in a variety of file formats, some specific to a given type of computer or software.

A digital image is stored as a computer graphics file allowing it to be viewed, printed, transmitted and edited. There are two basic forms of computer graphics: bit-maps and vector graphics. Nearly all digital images are stored as bit-maps and there are four bit-map file formats that you can use: JPEG, GIF, TIFF and BMP. When deciding which of these you will use to store your digital images, it is important to consider the pros and cons of each:

Format	**Definition**	**Ideal types of images for this format.**	**Notes**
JPEG (Joint Photographic Experts Group)	JPEG is a compressible bit-map graphic format that can be saved in three different formats: Baseline Standard, Baseline Optimised, and Progressive. Appears as .jpeg , .jpg, .jif or .jfif	Excellent for storing photographs that have continuous tone, many thousands of colours and complex textures and gradients.	JPEG supports very high quality images, but because of this the files can be large. JPEGs can support images with millions of colours. JPEGs are supported widely by web browsers. JPEGs discard information every time they are saved. To assure the

			highest quality picture, only save your file once as a JPEG.
GIF (Graphic Interchange Format)	The GIF file format is commonly used to display indexed colour graphics and images in HTML documents over the World Wide Web. Appears as .gif	Best used for images that have large areas of flat colours like cartoons or illustrations. Only supports 256 colours as opposed to JPEGs millions of colours.	Does not discard information when images are saved again.
TIFF (Tagged Image File Format)	TIFF is an image file format used extensively for the storage of high-quality images. Appears as .tif or tiff	Best used for master images, indeed is the defacto standard.	A highly flexible and platform-independent format which is supported by numerous image processing applications.
Windows Bitmap	Also referred to as a raster graphic; a method of storing information that maps an image pixel. The bitmap image consists of rows of pixels. Appears as .BMP	Standard image format on DOS and Windows-compatible computers and commonly used for Windows applications.	Very large file size compared to JPEG or GIF but has none of the flexibility. Supported by most Windows graphics applications.

Further information on compression, colour modes, vector and bitmap formats is available within the onine version of this course.

EXERCISE

Now that you better understand concepts like resolution and file format, it is time to consider how they might relate to the different types of collection materials you wish to digitise. What follows is a guide to the kinds of conversion methods and equipment, along with resolutions, you should consider as part of your preparation and research. This chart will help you decide where you should concentrate your resources. If the bulk of your collection consists of colour maps or illustrations then it may well be more cost effective, and less time consuming, to use a flatbed scanner capable of producing 24-bit images at 300 dpi. Use the chart below to analyse what your institutional needs are. Once you have established your priorities you can then look at what equipment is available, its cost or indeed alternatives like contracting out.

Table for analysing possible media types and resolution recommendations

Media & Document Type	**Conversion Method**	**Resolution**	**Archive File Format**
Illustrations, Maps, Manuscripts	Flatbed Scanner or Digital Camera	8-bit greyscale or 24-bit colour, 300 dpi	TIFF
3-dimensional objects to be represented in 2-dimensions	Digital Camera	24-bit colour, 600 dpi	TIFF

35 mm Black & White & Colour slide or negative	Slide Scanner	24-bit, 1200 dpi	TIFF or Photo CD
Medium to Large Format photograph, slide, negative, transparency or colour microfiche	Digital camera or Drum Scanner	24-bit (or higher), 300 dpi	TIFF or Photo CD
Black & White text document	Flatbed scanner or digital camera	1-bit, 300 or 600 dpi	TIFF (with CCITT Fax 4 compression)

Do you understand:

- The meaning of the terms pixel, bit-depth and resolution?
- What file formats are available?
- The pros and cons of all the different file formats?

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STANDARDS

INTRODUCTION METADATA DESCRIBING THE OBJECT IMAGE STANDARDS & GUIDELINES

THIS MODULE WILL EXPLAIN:

- The use of metadata in handling digital images
- Documentation of digital images
- Image standards and guidelines
- Preservation and storage standards and guidelines

INTRODUCTION

The type of data accompanying digitised materials determines how they can be searched, sorted and displayed. Museums are more capable of managing their collections when they use proper database management technologies and documentation in conjunction with digital imaging projects.

Good documentation of your images is extremely important. This documentation will consist of two parts: you will need to provide content information about the object captured in each digital image to make your electronic resource meaningful. You will also need to provide technical information about the image itself to enable systems to retrieve and display the image. This documentation is a time-consuming but very important part of a digitisation project.

METADATA

The images produced in a digitisation project contain valuable data – or information – about the objects which have been photographed. Metadata may be defined as *data about this data.* It is important to distinguish three main types of metadata:

- Data about the subject content of the image – which tells what the image is about at what interpretive significance it may have.
- Data which categorises the image within a system of subject headings – which is needed to locate, retrieve and handle the subject content
- Data about the technical characteristics of the image – which is needed to determine computer equipment and software requirements for retrieval, handling, storage and suitability for use in particular interpretive products.

Descriptive meta-data (content information) is information about the object captured in the image. If a computerized collections management system is in place, this information may be available, although recent studies have shown that many museum collections management systems still lack this type of information, which must be available if data sharing and public presentation are part of the project plan. CHIN's data dictionaries and other related documents on content standards are schemas that can help a museum determine what type of content meta-data it needs to record, and how to record it.

DESCRIBING THE OBJECT

If you already have a computerized collections management system, you may already have textual information describing the object; digital images will add value to your system. In order to provide good information, you should be aware of structural standards and content standards. The former will define the fields you use to describe an object; these may be predefined by your collections management package. The content standards define or provide guidance for the information you will put in the fields. Data structure standards, such as the CHIN data dictionaries, provide guidelines to assist in determining what fields of information you should include in your collections management system. They also describe the format in which to enter the data. If you are creating an image database separate from your collections management system, you will want to ensure that this information is consistent. Generally speaking, you should consider displaying the following fields with your record. The following list, taken from CHIN's Data Dictionary for the humanities, includes the record fields you may wish to display with an image. Think of it as the text accompanying an object in your museum. No doubt you have standard fields of information on every object on display. Remember that people looking at your information online do not necessarily follow physical groupings as they are naturally set out in a museum. Even if your online information is grouped online by theme, artist, style or period, it can normally be viewed in any order a viewer may choose; therefore you must provide as much contextual information as possible.

- Object Name
- Object Type
- Title
- Artist/Maker or
- Manufacturer
- Materials
- Technique
- Dimensions (height, length, width, depth) HT/LE/WI/DP
- Subject
- Date: (CHIN Date of object from; Date of object to; production date; School/Style)
- Cultural Context
- Description
- Artist Birth Date
- Artist Death Date
- Institution
- Copyright Details
- Origin Country
- Origin Province

Further information on metadata and how it should be used is available within the online version of this course.

IMAGE STANDARDS & GUIDELINES

No published standards or guidelines exist for determining the level of image quality required to create digital images. Most of the existing studies conducted to determine optimum image resolution and image file formats indicate that the higher the image quality, the greater the longevity of the images. Choosing a common process and format when digitising a collection will greatly facilitate subsequent image processing. Only the master images should be used to create subsequent surrogate images.

The image capture process should produce digital images of the highest quality feasible in terms of resolution and colour depth. These are the master or archival images, and should be stored in an offline mode or kept accessible in read-only mode. Ordinarily these master images should be accessed infrequently, kept in the original format and used only to create surrogate images.

From master images and surrogate images, working copies can be produced for a variety of purposes. However it is important to remember that different applications require images of varying quality. Consequently if you require Digital images for visual references in an electronic database, such as the World Wide Web, they need only be low-resolution formats. So a copy of a surrogate image would suffice. Digital images used for high-quality printing, however, will require a substantially higher resolution image. To do this you may need to access the master image. However if this is a common request then you should consider producing surrogate images of a relatively high resolution and use these instead of continually accessing your masters.

To ascertain the quality required for digital imaging, it is first necessary to determine the intended uses for the images. The most common use for digital images is to make them available over the World Wide Web, via a collections management system, as low-quality, thumbnail images. Less common, but increasing in importance, is digital reproduction for printing or CDROMs. These larger or more detailed reproductions require images of higher quality. Specialty uses of images for conservation work, detailed analysis of works of art, etc. require substantially higher quality images.

Further information on preservation and storage standards and guidelines is available within the onine version of this course.

Other institutions with useful metadata resources and advice on descriptive, structural and image standards include: CIMI, The Getty Standards Program, MDA and EdNA

Do you understand:

- What object information you should record and why?
- What image information you should record and why?
- What strategies you need to preserve your images?

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RAW IMAGE FILE FORMAT

From Wikipedia, the free encyclopedia

RAW image file

File extension:	`.raf (Fuji)`
	`.crw .cr2 (Canon)`
	`.kdc .dcr (Kodak)`
	`.mrw (Minolta)`
	`.nef (Nikon)`
	`.orf (Olympus)`
	`.dng (Adobe)`
	`.ptx .pef (Pentax)`
	`.arw .srf (Sony)`
	`.x3f (Sigma)`
	`.erf (Epson)`
	`.raw (Panasonic)`

Type of format:	Image file formats

A **raw image file** contains minimally processed data from the image sensor of a digital camera or image scanner. Raw files are so named because they are not yet processed and ready to be used with a bitmap graphics editor or printed. Normally, the image will be processed by a raw converter in a wide-gamut internal colorspace where precise adjustments can be made before conversion to an RGB file format such as TIFF or JPEG for storage, printing, or further manipulation.

Contents

There is no single RAW format: different manufacturers use their own proprietary formats, which are collectively known as RAW format. RAW files contain pixel data from the image sensor, usually at 12 or 14 bits per sensor bucket. The sensor is almost invariably overlaid with a so-called Bayer filter, consisting of a mosaic of red, blue and green filters in alternating rows of RG and GB. Given that three colors fit uncomfortably in a rectangular grid, green was chosen to be doubly present, since the human eye is more sensitive to it. Green also often serves as the luminance channel, and as the dominant channel for in-camera B&W conversions. To retrieve an image from a RAW file, this mosaic of data must be converted into a full RGB image. This is known as Demosaicing, but is referred to by many manufacturers as Digital Development.

The contents of RAW files are often considered to be of 'higher quality' than the final converted results, usually JPG. Each pixel in a RAW file has a greater bit-depth, and can thus store more subtle variations in color, and has more detail specifically in the shadow areas. Hence, large transformations of the data, such as increasing the exposure of a dramatically under-exposed photo, result in less visible artifacts. This leaves more scope for both corrections and artistic manipulations, without resulting in images with visible flaws such as posterization.

One variation on the Bayer scheme is the RGBE sensor of the Sony DSC-F828, which experimented with exchanging the Green in the RG rows with Emerald (cyan). This was claimed to increase the gamut of the response, but was gone again in the follow-up model. Other sensors, such as the Foveon X3 sensor capture information directly in RGB form, having three photosites in each pixel, one for each colour component.

Benefits

Nearly all digital cameras can process the image from the sensor into a JPEG file using settings for white balance, color saturation, contrast, and sharpness that are either selected automatically or entered by the photographer before taking the picture. Cameras that support RAW files save these settings in the file, but defer the processing. This results in an extra step for the photographer, so RAW is normally only used when additional computer processing is intended. However, RAW permits much greater control than JPEG for several reasons:

- Finer control is easier for the settings when a mouse and keyboard are available to set them. For example, the white point can be set to any value, not just discrete values like "daylight" or "incandescent".
- The settings can be previewed and tweaked to obtain the best quality image or desired effect. (With in-camera processing, the values must be set before the exposure). This is especially pertinent to the white balance setting since color casts can be difficult to correct after the conversion to RGB is done.
- Camera raw files have 12 or 14 bits of brightness information. But you cannot compare this number alone to other methods. JPEG stores a brightness gradient in an 8-bit number every 4 or 8 pixels and stores color values even more infrequently depending on the parameters used. Because of this JPEG loses fine details and is ill-suited for major color or brightness changes. By comparison the mosaicing used by the Bayer filter in raw files changes colors every 3-4 pixels and brightness every 1-2 pixels producing much finer resolution detail in a same size image. And because it is 12-bit each of these values are far more precise.
- The working color space can be set to whatever is desired.
- Different demosaicing algorithms can be used, not just the one coded into the camera.

Drawbacks

Camera raw files are typically 2-6 times larger than JPEG files. Some raw formats do not use compression, some implement lossless data compression to reduce the size of the files without affecting image quality and others use lossy data compression where quantization and filtering is performed on the image data. While use of raw formats avoids or reduces the compression artifacts inherent in JPEG, fewer images can fit on a given memory card. It also takes longer for the camera to write raw images to the card, so fewer pictures can be taken in quick succession (affecting the ability to take, for example, a sports sequence).

There is still no widely-accepted standard RAW format; Adobe's DNG format has been put forward as a standard, but is not adopted by major camera companies. Numerous different

RAW formats are currently in use; new RAW formats keep being developed, and others orphaned.

More specific software may be required to open RAW files on some systems, as opposed to standard formats like JPEG or TIFF.

The time taken in the image workflow is an important factor for choosing between RAW and ready-to-use image formats.

Software support

Cameras that support raw files typically come with proprietary software for conversion of their raw format to TIFF or JPEG. Other conversion programs and plugins are available from vendors that have either licensed the technology from the camera manufacturer or reverse-engineered the particular raw format. A portable open source program, dcraw, supports most raw formats and can be made to run on operating systems such as Unix not supported by most commercial software.

Raw file formats are proprietary, and differ greatly from one manufacturer to another, and sometimes between cameras made by one manufacturer. In 2004 Adobe Systems published the Digital Negative Specification (DNG), which is intended to be a unified raw format. Adobe Photoshop CS2 contains extensive support of RAW as does Adobe Photoshop Lightroom. As of 2006, a few camera manufacturers have started to announce support for DNG in newer camera models, including Leica & Pentax (native camera support) and Hasselblad (export). The Leica Digital-Modul-R (DMR) was first to use DNG as its native format.

Microsoft's Digital Image 2006 is able to recognize and organize RAW image formats such as .crw, .cr2, and .nef, which are file formats produced by Canon and Nikon.[1] For the Windows platform, there is a free download available for Windows XP that integrates viewing and printing into other included photo tools.[2]

In 2005, Apple Computer introduced several products which offered RAW file support. In January, Apple released iPhoto 5, which offered basic support for viewing and editing RAW files. In April, Apple introduced a new version of its operating system, Mac OS X v10.4, which added RAW support directly to the system, as part of the ImageIO framework, which adds RAW support automatically to the majority of Mac OS X applications (such as Preview, Mac OS X's PDF and image viewing application). Finally, in October, Apple released Aperture, a photo post-production software package for professionals whose chief feature is full support for RAW files.

There are many other "RAW workflow applications" designed to provide efficient post-processing of Raw images, including Helicon Filter, Phase One's Capture One and Bibble Labs' Bibble Pro. Like Apple Aperture and Adobe Photoshop Lightroom, these programs provide sophisticated controls for processing the information stored in the Raw file and converting RAW files to JPEG or TIFF. Picasa, a free image editing and cataloging program from Google, can read and display many RAW formats, but like iPhoto, Picasa provides only limited tools for processing the data in a RAW file.

UFRaw is free software based on dcraw. It can be used as a GIMP plugin and is available for most operating systems.

RawShooter Essentials 2005/6 was free software developed by Pixmantec. In 2006 Adobe Systems Inc acquired the assets of Pixmantec ApS. RawShooter Essentials is no longer be updated (The last update added support for the Canon 5D and the Nikon D200). It could still be downloaded as a free product until Adobe's Photoshop Lightroom 1.0 was released in March 2007. The software was fully featured, including wide support for various RAW formats, file priority sorting and batch processing.

Processing

There is no single standard algorithm for converting data from a Bayer filter or Foveon sensor into RGB format; a number of different algorithms have been proposed, and some have been patented in the USA. Different programs may give slightly different results, better or worse subjectively, for any particular image.

RAW files are sometimes referred to as **CCD-RAW** (even for CMOS sensors).

Although the term "raw" describes files in the classical sense of "raw data" vs. "cooked data", raw files typically are slightly processed in the camera. In general, this processing is limited to algorithms that require direct access to the camera's hardware. This includes "long exposure noise reduction" (aka “dark frame subtraction”) and the mapping out of "hot" (too bright) or "dead" (too dim) pixels. Image noise reduces the effectiveness of compression algorithms, so rudimentary noise reduction is often applied to the raw image before compression, to reduce file sizes.

TIFF - Tagged Image File Format

From Wikipedia, the free encyclopedia

Tagged Image File Format	
File extension:	`.tiff, .tif`
MIME type:	`image/tiff, image/tiff-fx`
Type code:	TIFF
Uniform Type Identifier:	public.tiff
Developed by:	Aldus, now Adobe Systems
Type of format:	Image file formats
Extended to:	Exif, DCF, TIFF/EP

Tagged Image File Format (abbreviated **TIFF**) is a file format for mainly storing images, including photographs and line art. Originally created by the company Aldus, jointly with Microsoft, for use with PostScript printing, TIFF is a popular format for high color depth images, along with JPEG and PNG. TIFF format is widely supported by image-manipulation applications such as Photoshop by Adobe, GIMP, Ulead PhotoImpact, and Photo-Paint as well as Paint Shop Pro by Corel, by desktop publishing and page layout applications, such as QuarkXPress and Adobe InDesign, and by scanning, faxing, word processing, optical character recognition, and other applications. TIFF was chosen as the native format for raster graphics in the NeXTstep operating system, and this TIFF support carried over into Mac OS X. Adobe Systems, which acquired the PageMaker publishing program from Aldus, now controls the TIFF specification, although it has not had a major update since 1992 (several technical notes have been published with minor extensions to the format).

History

The phrase "Tagged Image File Format", or, actually, "Tag Image File Format", was used as a subtitle in some earlier versions of the TIFF specification. The current TIFF specification, TIFF 6.0, makes no mention of these phrases; the name is now, simply, "TIFF".

TIFF was originally created as an attempt to get desktop scanner vendors of the mid-1980's to agree on a common scanned image file format, rather than have each company promulgate its own proprietary format. In the beginning, TIFF was only a bi-level image format, since that was all that desktop scanners could handle. As scanners became more powerful, and as desktop computer disk space became more plentiful, TIFF grew to accommodate grayscale images, then color images.

Flexible options

TIFF is a flexible and adaptable file format. It can handle multiple images and data in a single file through the inclusion of "tags" in the file header. Tags can indicate the basic geometry of the image, such as its size, or define how the image data is arranged and whether various image compression options are used. For example, TIFF can be used as a container for JPEG and RLE (run-length encoding) compressed images. A TIFF file can also include a vector-based Clipping path (an outline that crops or frames the main image). The ability to store image data in a lossless format makes TIFF files a useful method for archiving images. Unlike standard JPEG, TIFF files can be edited and resaved without suffering a compression loss. Other TIFF file options include multiple layers or pages.

Although it is a widely accepted standard format today, when TIFF was first introduced, its extensibility led to compatibility problems. Programmers were free to specify new tags and options, but not all programs implemented support for all the tags that had been created. As a result the lowest common denominator soon became "the" TIFF, and even today the vast majority of TIFF files, and the code that reads them, are based on a simple 32-bit uncompressed image.

TIFF has an option to use LZW compression, a lossless data compression technique for reducing file size. Until recently, the use of this option was limited because the LZW technique was the subject of several patents. However, these patents have now all expired.

Every TIFF file begins with a 2-byte indicator of byte order: "II" for little endian and "MM" for big endian byte ordering. The following 2 bytes represent the number 42. The number 42 was selected "for its deep philosophical significance." The reading of 42 is dependent on the byte order indicated in the first 2 bytes. The entire file is read based on the indicated byte order.

Byte order can cause compatibility issues between Apple Macintosh and Windows programs, which typically use different byte order for TIFF files. Some programs offer the option of saving in Mac or Windows byte order so files can be used across platforms.

TIFF in document imaging

TIFF format is standard in document imaging and document management systems. In this environment it is normally used with CCITT Group IV 2D compression, which supports black-and-white (also called bitonal or monochrome) images. In high-volume environments, documents are typically scanned in black and white (rather than color or grayscale) to conserve storage capacity. An average A4 scan produces 30 kilobytes (KB) of data at 200 ppi (pixels per inch resolution) and 50 KB of data at 300 ppi. 300 ppi is far more common than 200 ppi.

Because TIFF format supports multiple pages, multi-page documents can be saved as single TIFF files rather than as a series of files for each scanned page.

Exploits

The TIFF file format is unusual in comparison to other image formats, in that it is composed of small descriptor blocks containing offsets into the file which point to the actual pixel image data (composed of bands of pixel rows). This means that incorrect offset values can cause programs to attempt to read erroneous portions of the file or attempt to read past the physical end of file. Like most other image file formats, improperly encoded packet or line lengths within the file can cause poorly written rendering programs to overflow their internal buffers. Properly written image rendering programs generally avoid such pitfalls.

List of Cameras supporting RAW format (as at 16 Feb 2009)

From Wikipedia

http://en.wikipedia.org/wiki/List_of_cameras_supporting_a_raw_format

The following digital cameras allow photos to be taken and saved in at least one raw image format. Some cameras support more than one, usually a proprietary format and Digital negative (DNG).

Canon

- Canon DIGITAL IXUS using the custom CHDK firmware
- Canon PowerShot using the custom CHDK firmware
- Canon EOS-1Ds
- Canon EOS-1Ds Mark II
- Canon EOS-1Ds Mark III
- Canon EOS-1D Mark II
- Canon EOS 5D
- Canon EOS 5D Mark II
- Canon EOS 10D
- Canon EOS 20D
- Canon EOS 30D
- Canon EOS 40D
- Canon EOS 50D
- Canon EOS D30
- Canon EOS D60
- Canon EOS 300D, also known as the Canon EOS Kiss Digital or Canon EOS Digital Rebel
- Canon EOS 350D, also known as the Canon EOS Kiss Digital N or Canon EOS Digital Rebel XT
- Canon EOS 400D, also known as the Canon EOS Kiss Digital X or Canon EOS Digital Rebel XTi
- Canon EOS 450D, also known as the Canon EOS Kiss Digital X2 or Canon EOS Digital Rebel XSi
- Canon EOS 1000D, also known as the Canon EOS Kiss Digital F or Canon EOS Digital Rebel XS
- Canon PowerShot G1
- Canon PowerShot G2
- Canon PowerShot G3
- Canon PowerShot G5
- Canon PowerShot G6
- Canon PowerShot G9
- Canon PowerShot G10
- Canon PowerShot Pro1
- Canon PowerShot Pro90 IS
- Canon Powershot S60
- Canon Powershot S70

Fujifilm

- Fujifilm FinePix 20 Pro
- Fujifilm FinePix E900
- Fujifilm FinePix S100FS
- Fujifilm FinePix S5100/5500
- Fujifilm FinePix S5200/5600
- Fujifilm FinePix S7000
- Fujifilm FinePix S6500fd
- Fujifilm FinePix S9000/9500
- Fujifilm FinePix S9100/9600
- Fujifilm FinePix S1 Pro
- Fujifilm FinePix S2 Pro
- Fujifilm FinePix S3 Pro
- Fujifilm FinePix S5 Pro
- Fujifilm FinePix IS-Pro

Imacon

- Imacon Ixpress

Hasselblad

- Hasselblad H series
- Hasselblad CF series
- Hasselblad CFV series

Kodak

- Kodak P712
- Kodak P850
- Kodak P880 saved in .KDC format
- Kodak C603/C643 via hidden debug menu
- Kodak Z1015IS

Konica Minolta

- Konica Minolta DiMAGE A1
- Konica Minolta DiMAGE A2
- Konica Minolta DiMAGE A200
- Konica Minolta Maxxum 5D
- Konica Minolta Maxxum 7D

Leaf

- Leaf Digital Backs

Leica

- Leica M8
- Leica M8.2
- Leica Digilux 2
- Leica Digilux 3
- Leica V-LUX 1
- Leica D-LUX 3
- Leica D-LUX 4
- Leica Digital Modul-R

Nikon

- Nikon Coolpix P6000
- Nikon Coolpix 5000 (as of Firmware ver. 1.7 12/18/03)
- Nikon Coolpix 5700
- Nikon D2X
- Nikon D3
- Nikon D40
- Nikon D40x
- Nikon D50
- Nikon D60
- Nikon D70/D70s
- Nikon D80
- Nikon D90
- Nikon D200
- Nikon D300
- Nikon D700

Olympus

- Olympus E-1
- Olympus E-3
- Olympus E-10
- Olympus E-20

- Olympus E-300
- Olympus E-330
- Olympus E-400
- Olympus E-410
- Olympus E-420
- Olympus E-500
- Olympus E-510
- Olympus E-520
- Olympus C-5050Z
- Olympus C-5060WZ
- Olympus C-8080WZ
- Olympus SP-320
- Olympus SP-350
- Olympus SP-570 UZ

Panasonic

- Panasonic Lumix DMC-FZ8
- Panasonic Lumix DMC-FZ18
- Panasonic Lumix DMC-FZ28
- Panasonic Lumix DMC-FZ30
- Panasonic Lumix DMC-FZ50
- Panasonic Lumix DMC-G1
- Panasonic Lumix DMC-LX2
- Panasonic Lumix DMC-LX3

Pentax

- Pentax *ist D
- Pentax *ist DL
- Pentax *ist DL2
- Pentax *ist DS
- Pentax *ist DS2
- Pentax K10D - PEF and DNG.
- Pentax K20D
- Pentax K100D
- Pentax K100D Super
- Pentax K110D
- Pentax K200D
- Pentax K2000/K-m

Phase One

- All Phase One Digital Backs

Polaroid

- Polaroid x530

Ricoh

- Ricoh Caplio GX100
- Ricoh GR Digital
- Ricoh GR Digital II

Samsung

- Samsung GX-10 - DNG.
- Samsung GX-20
- Samsung Pro815

Sigma

- Sigma DP1
- Sigma DP2

- Sigma SD9
- Sigma SD10
- Sigma SD14

Sony

- Sony α 100 - SRF
- Sony α 200
- Sony α 300
- Sony α 350
- Sony α 700
- Sony α 900
- Sony V3
- Sony Cyber-Shot DSC-F828
- Sony Cyber-shot DSC-H50
- Sony Cyber-shot DSC-R1

Other

Some Nikon Coolpix cameras which are not advertised as supporting a RAW format can actually produce usable raw files if switched to a maintenance mode.

. Note that switching to this mode can invalidate a camera's guarantee. Nikon models with this capability: E700, E800, E880, E900, E950, E990, E995, E2100, E2500, E3700, E4300, E4500.
Some Canon PowerShot cameras with DiGiC II and certain DiGiC III image processors which are not advertised as supporting a RAW format can actually produce usable raw files with an unofficial open-source firmware add-on by some users. Please see http://chdk.wikia.com/wiki/FAQ for the list of currently supported models.

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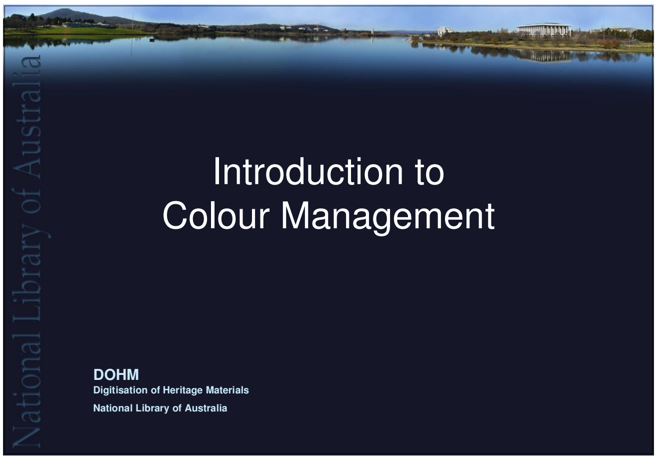
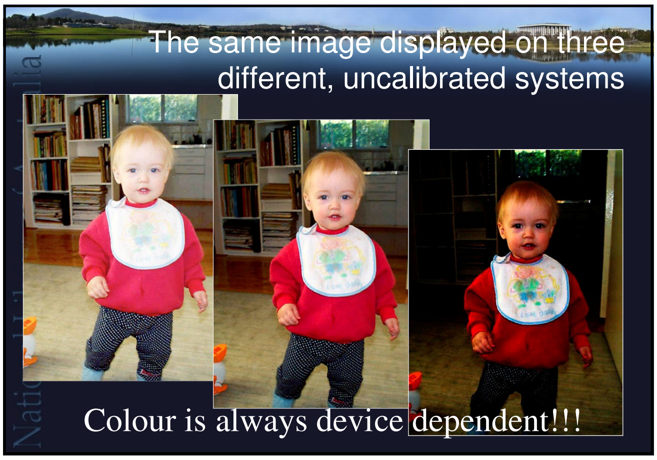


National Library of Australia

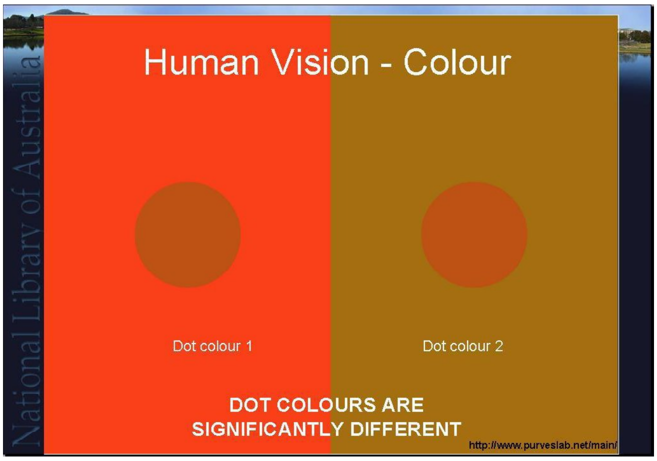
Introduction to Colour Management

DOHM
Digitisation of Heritage Materials
National Library of Australia



The same image displayed on three different, uncalibrated systems

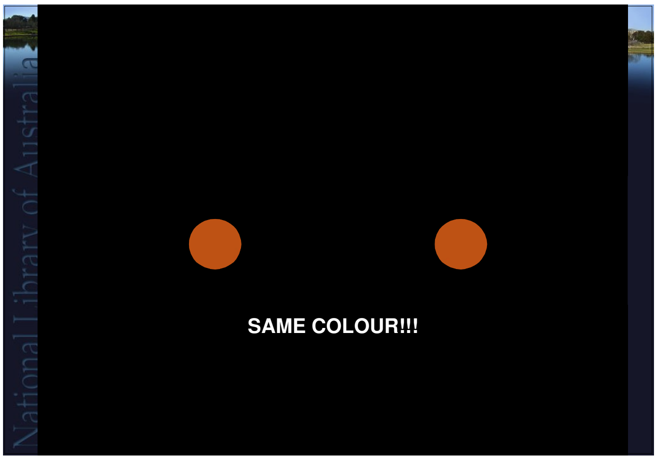
Colour is always device dependent!!!



Human Vision - Colour

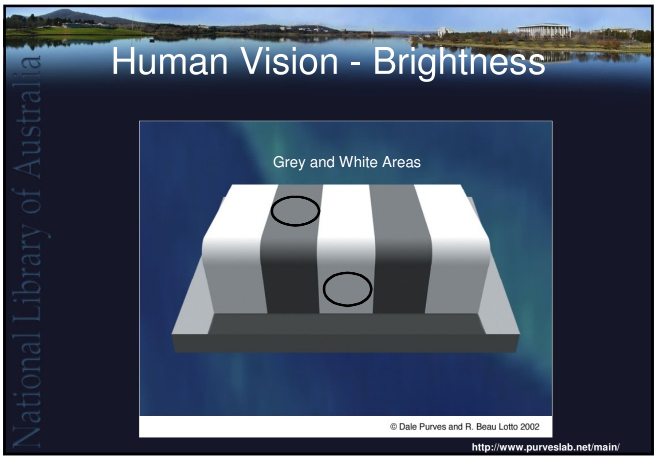
DOT COLOURS ARE SIGNIFICANTLY DIFFERENT

http://www.purveslab.net/main/



SAME COLOUR!!!

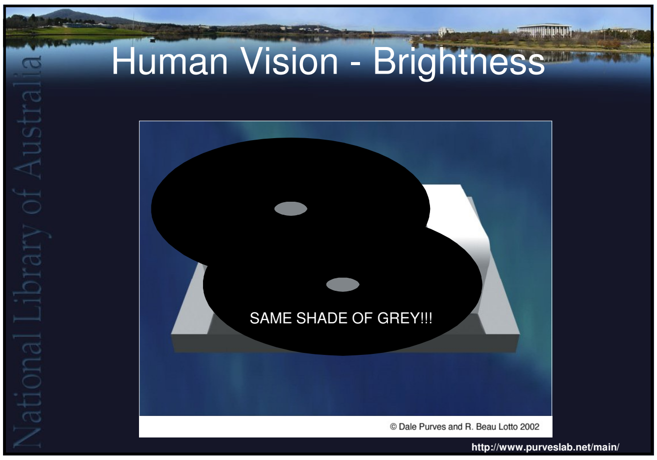
Human Vision - Brightness



© Dale Purves and R. Beau Lotto 2002

http://www.purveslab.net/main/

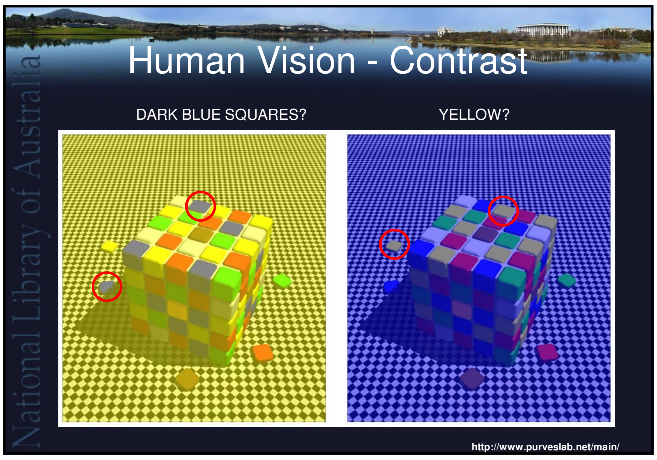
Human Vision - Brightness



SAME SHADE OF GREY!!!

© Dale Purves and R. Beau Lotto 2002

http://www.purveslab.net/main/

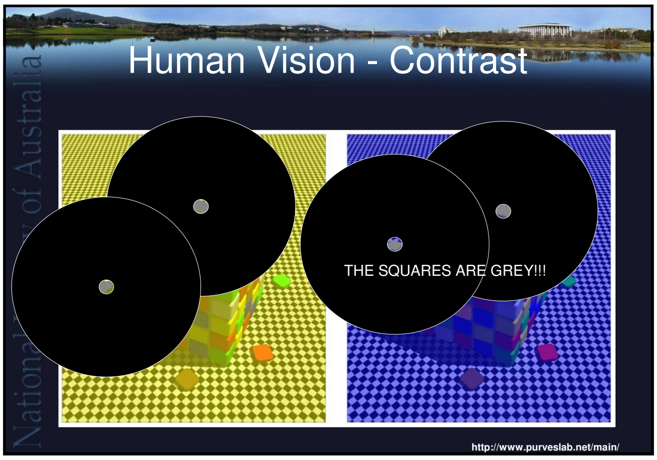


Human Vision - Contrast

DARK BLUE SQUARES?

YELLOW?

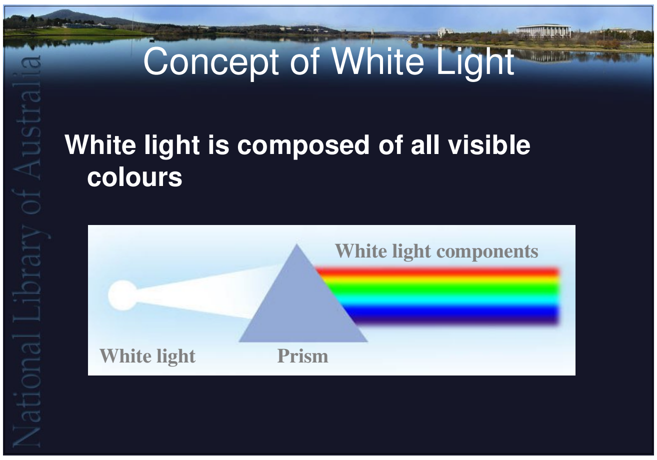
http://www.purveslab.net/main/



Human Vision - Contrast

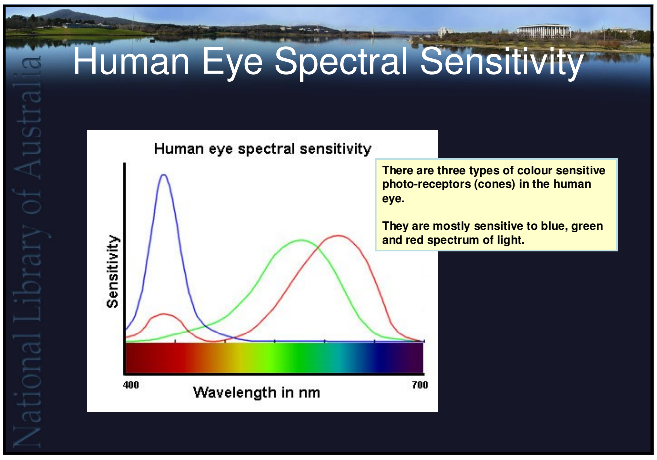
THE SQUARES ARE GREY!!!

http://www.purveslab.net/main/



Concept of White Light

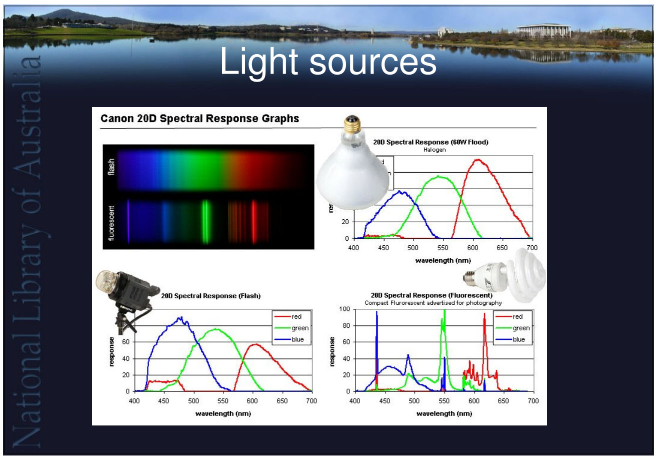
White light is composed of all visible colours



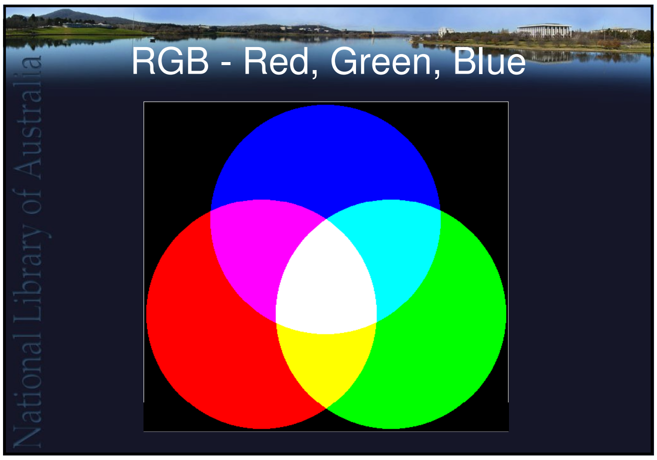
Human Eye Spectral Sensitivity

There are three types of colour sensitive photo-receptors (cones) in the human eye.

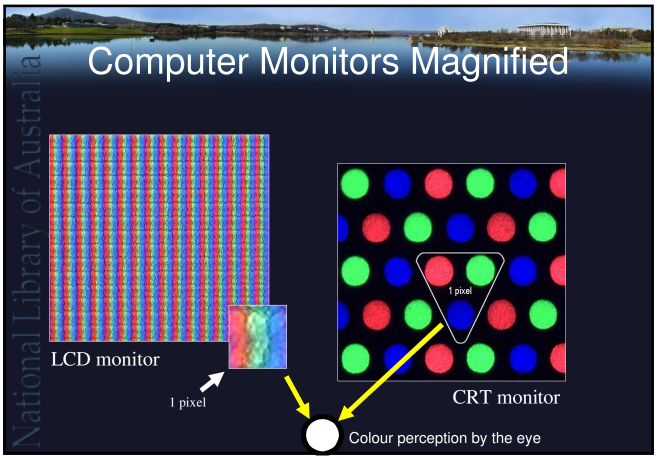
They are mostly sensitive to blue, green and red spectrum of light.



Light sources

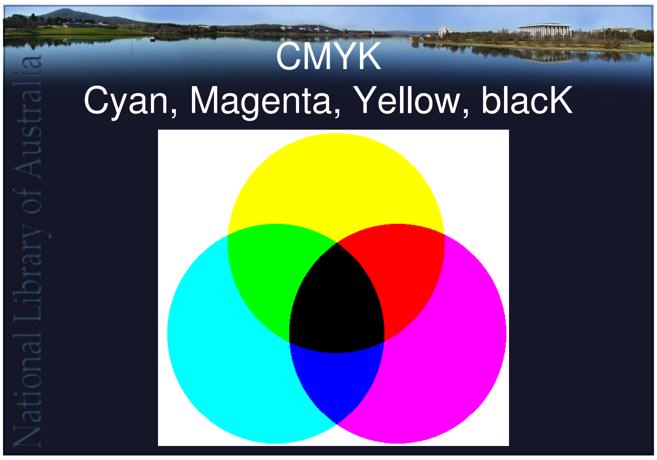


RGB - Red, Green, Blue



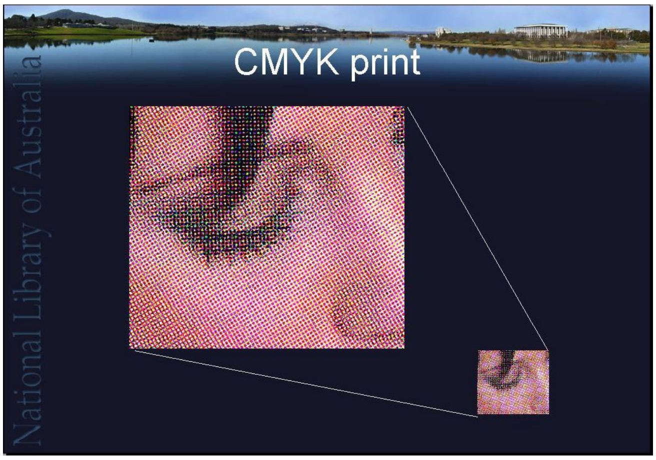
Computer Monitors Magnified

National Library of Australia



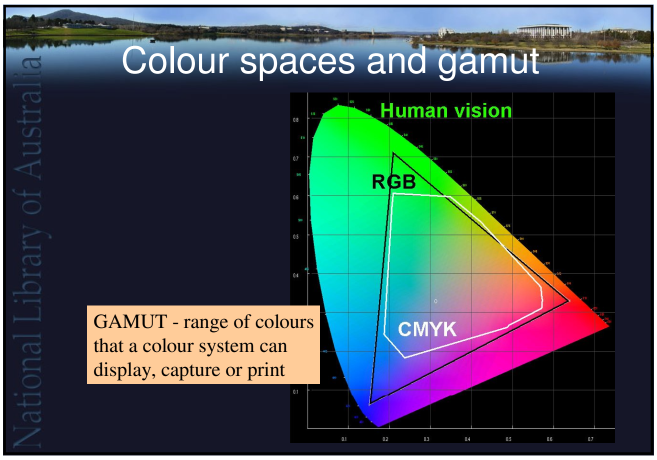
CMYK
Cyan, Magenta, Yellow, blacK

National Library of Australia



CMYK print

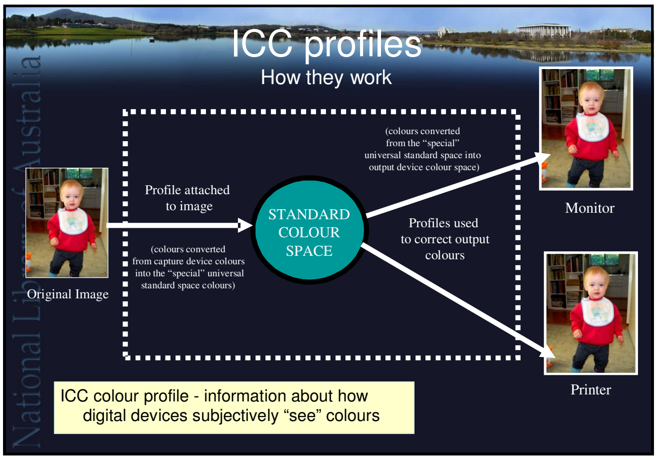
National Library of Australia



Colour spaces and gamut

GAMUT - range of colours that a colour system can display, capture or print

National Library of Australia



ICC profiles
How they work

Original Image
Profile attached to image
(colours converted from capture device colours into the “special” universal standard space colours)
STANDARD COLOUR SPACE
(colours converted from the “special” universal standard space into output device colour space)
Profiles used to correct output colours
Monitor
Printer

ICC colour profile - information about how digital devices subjectively “see” colours

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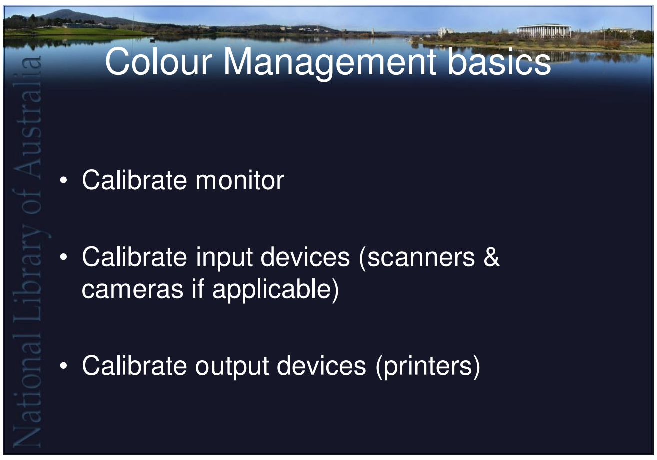

Colour Management basics

- Calibrate monitor
- Calibrate input devices (scanners & cameras if applicable)
- Calibrate output devices (printers)

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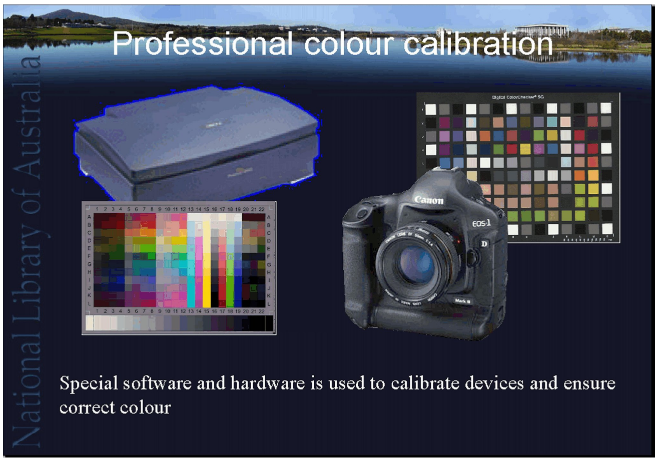

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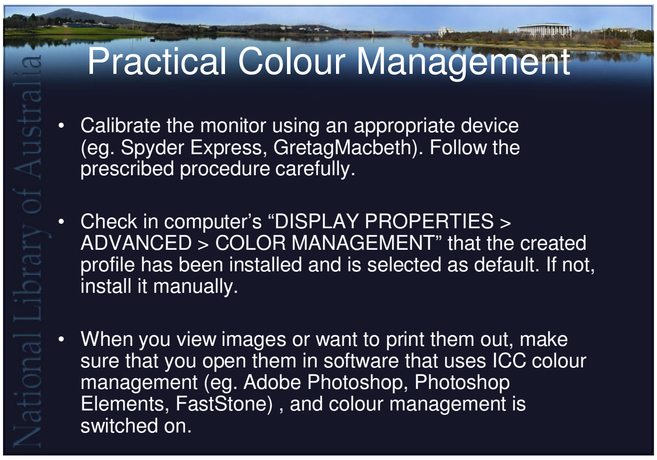
Professional colour calibration

Special software and hardware is used to calibrate devices and ensure correct colour



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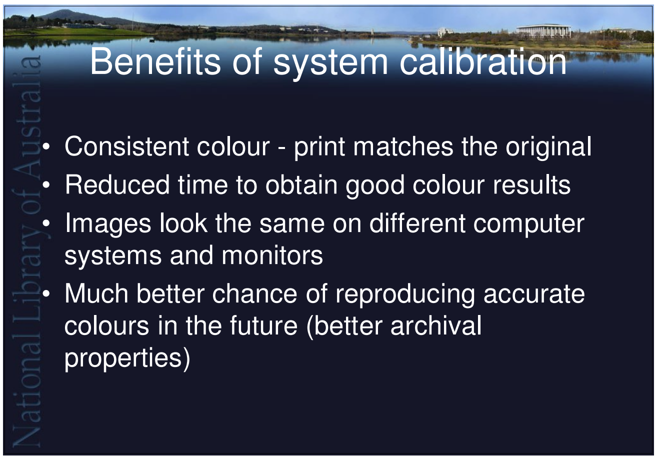
Practical Colour Management

- Calibrate the monitor using an appropriate device (eg. Spyder Express, GretagMacbeth). Follow the prescribed procedure carefully.
- Check in computer’s “DISPLAY PROPERTIES > ADVANCED > COLOR MANAGEMENT” that the created profile has been installed and is selected as default. If not, install it manually.
- When you view images or want to print them out, make sure that you open them in software that uses ICC colour management (eg. Adobe Photoshop, Photoshop Elements, FastStone) , and colour management is switched on.



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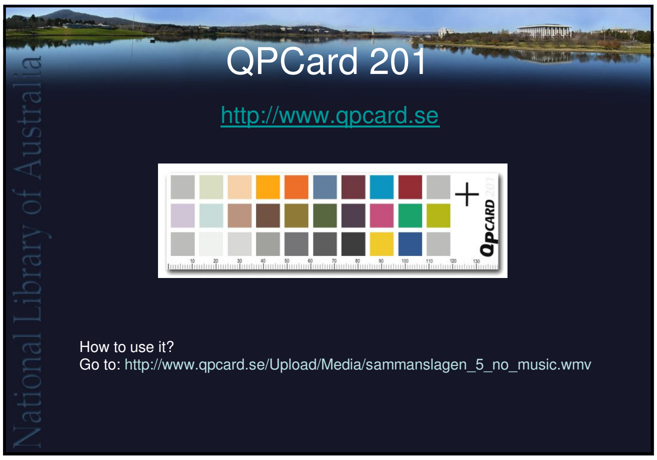
Benefits of system calibration

- Consistent colour - print matches the original
- Reduced time to obtain good colour results
- Images look the same on different computer systems and monitors
- Much better chance of reproducing accurate colours in the future (better archival properties)



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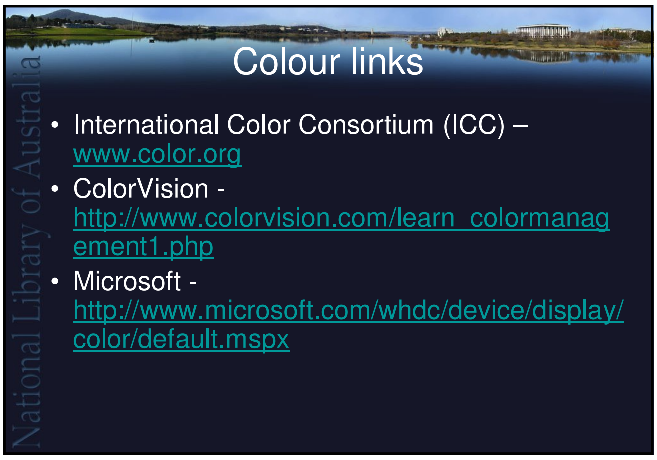
QPCard 201

http://www.qpcard.se

How to use it?
Go to: http://www.qpcard.se/Upload/Media/sammanslagen_5_no_music.wmv



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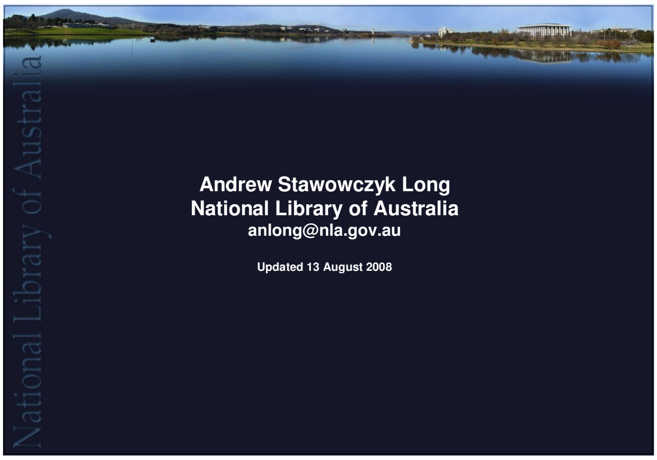
Colour links

- International Color Consortium (ICC) – www.color.org
- ColorVision - http://www.colorvision.com/learn_colormanagement1.php
- Microsoft - http://www.microsoft.com/whdc/device/display/color/default.mspx



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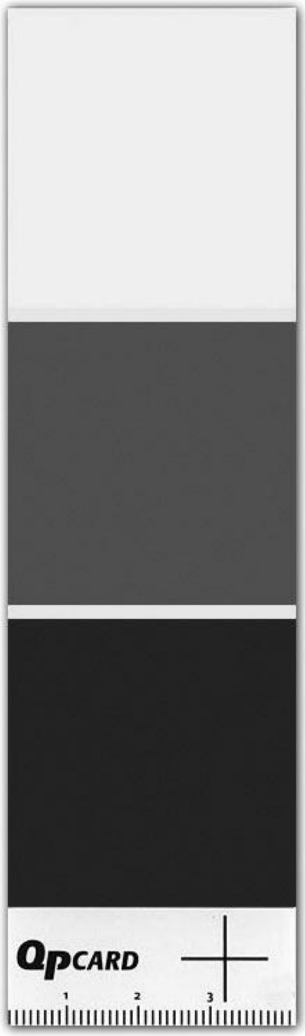
Andrew Stawowczyk Long
National Library of Australia
anlong@nla.gov.au

Updated 13 August 2008

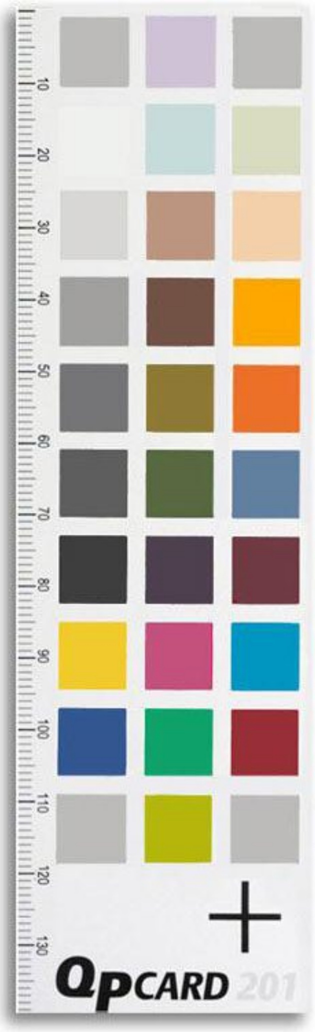
QPcard targets for exposure setup and colour management of images

http://www.qpcard.se

QPcard Sample pack with one QPcard 101
and one QPcard 201. US$ 17.24 / EUR 13.51
(as at 18 November 2008)



QPcard 101



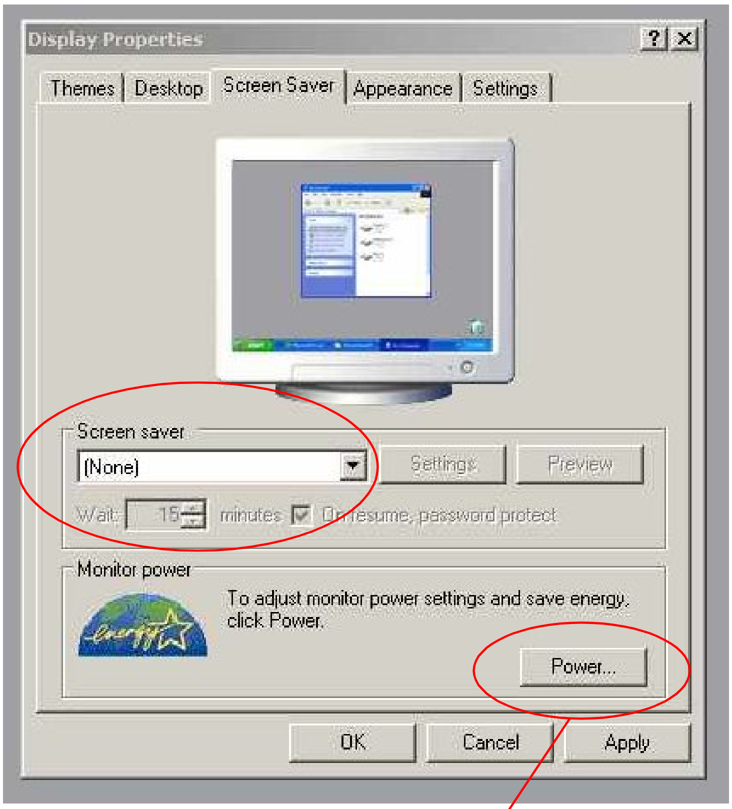
QPcard 201

Monitor Calibration with Spyder2express

Note: Currently, most consumer-grade LCD (Liquid Crystal Display – or flat panel type) monitors do not support high quality colour management. Only a few, very expensive brands, produce excellent quality LCD monitors.
Ordinary CRT (Cathode Ray Tube) monitors may prove to be not much better. On the other hand, CRT Trinitron monitors are high-quality devices that are much cheaper than professional quality LCDs. This situation will inevitably change in the near future with LCD technology getting better and cheaper.

Calibration procedure:

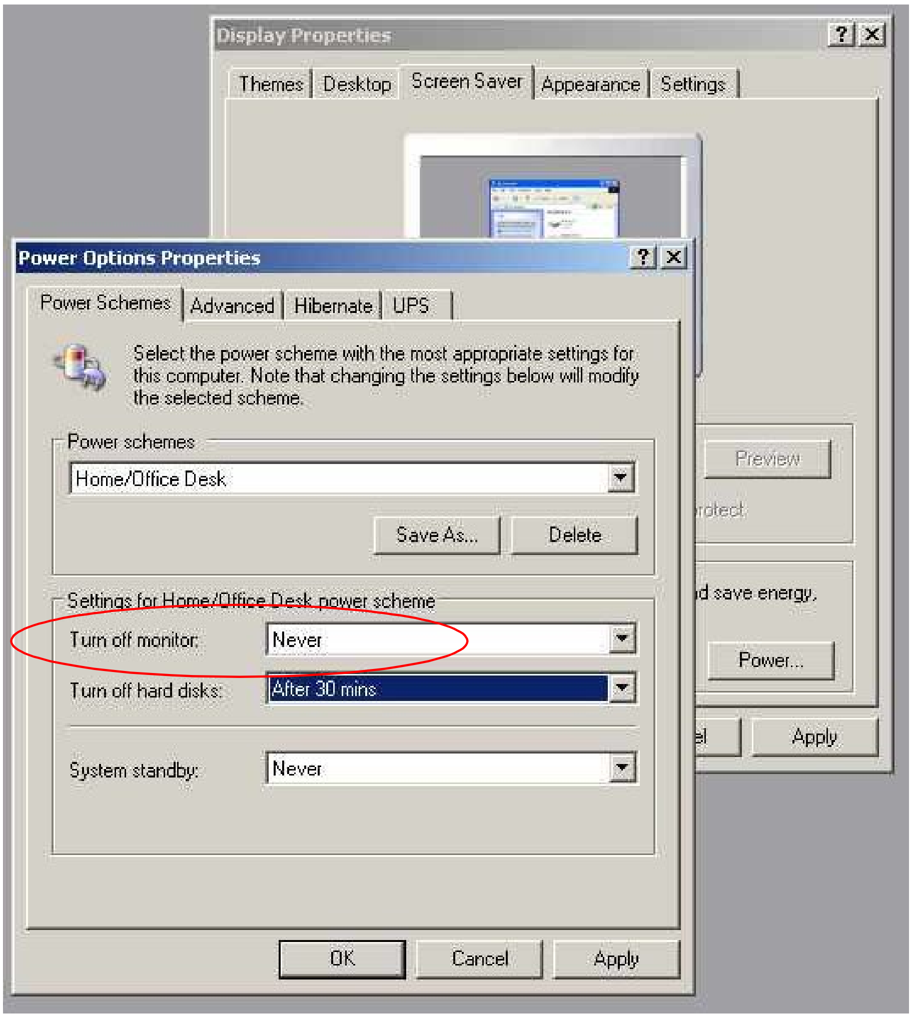
1. Turn the monitor ON
2. Install Spyder2Express software on the computer.
3. Disable screen saver and power management (click START > CONTROL PANEL > DISPLAY)



Screen saver: (None)
Wait: 15 minutes ☑ On resume, password protect

To adjust monitor power settings and save energy, click Power.

Click to Enter



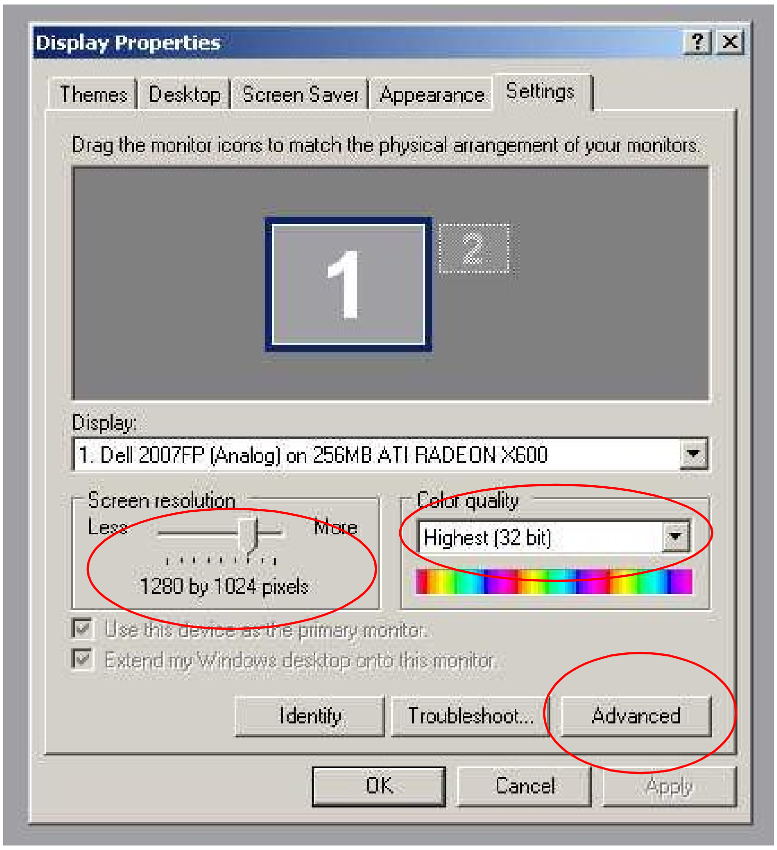
Select the power scheme with the most appropriate settings for this computer. Note that changing the settings below will modify the selected scheme.

Power schemes: Home/Office Desk

Settings for Home/Office Desk power scheme

Turn off monitor: Never
Turn off hard disks: After 30 mins
System standby: Never

4. Wait 1 hour for the monitor to warm up.
5. Turn off and block strong ambient lights that can affect calibration.
6. Make sure that the display's "Color Quality" is set to 24-bit or higher and "Screen Resolution" to minimum 1024 x 768 pixels.



Drag the monitor icons to match the physical arrangement of your monitors.

Display:
1. Dell 2007FP (Analog) on 256MB ATI RADEON X600

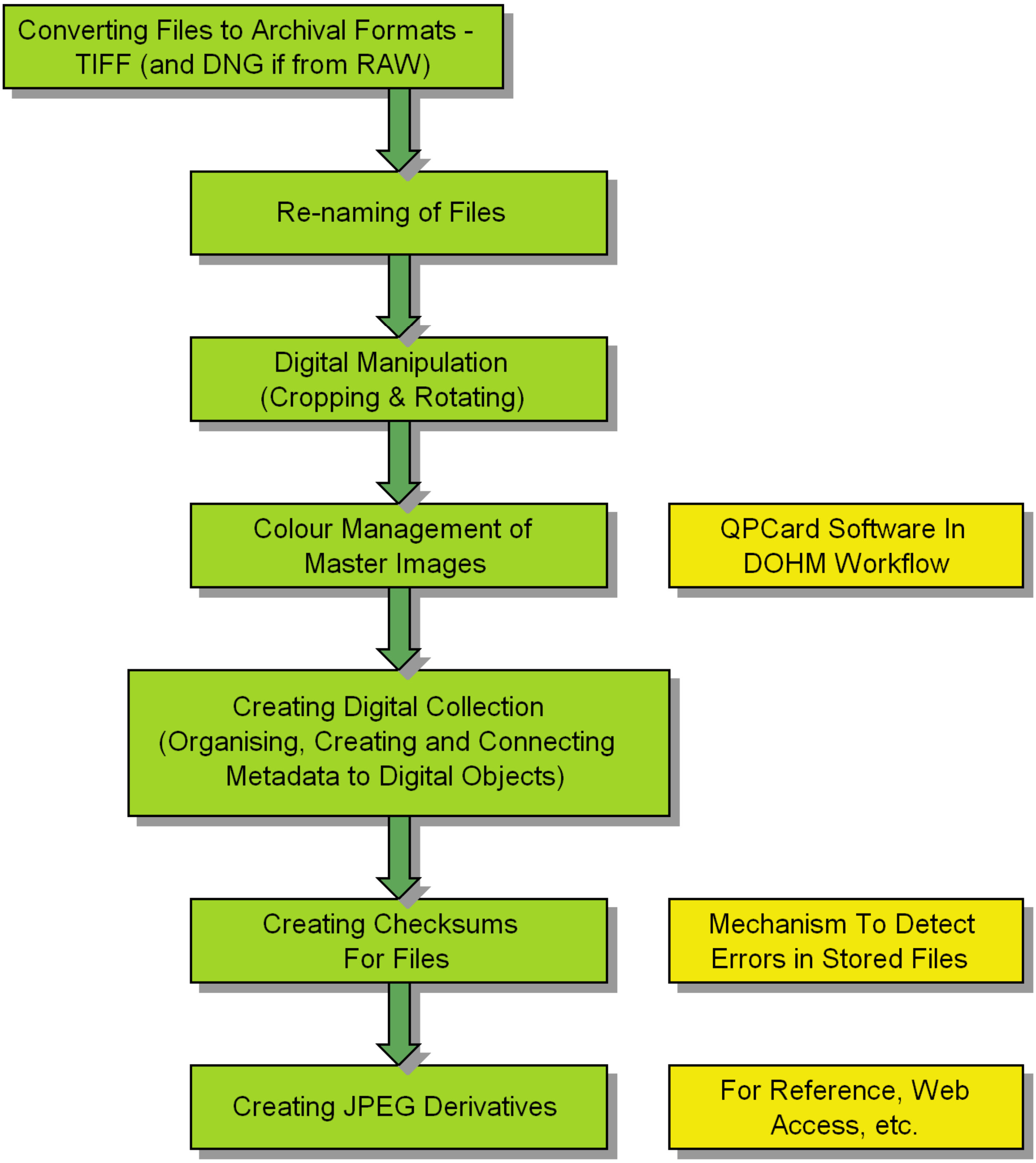
Screen resolution
1280 by 1024 pixels

Color quality
Highest (32 bit)

☑ Use this device as the primary monitor.
☑ Extend my Windows desktop onto this monitor.

7. Click ADVANCED button and select TROUBLESHOOT tab. Make sure that “Hardware Acceleration” is set to FULL.
8. Disable all CD-burning resident programs. (Press and hold down CTRL+SHIFT+ESC keys to invoke Widows Task Manager. Click PROCESSES tab and look for the following Image Names: adaptec, easycd, createcd, directcd or roxio. If found, click on the name to select it and use END PROCESS button to terminate.
9. Run Spyder2Express software and follow the instructions.

IMAGE MANIPULATION & MANAGEMENT


Converting Files to Archival Formats - TIFF (and DNG if from RAW)
Re-naming of Files
Digital Manipulation (Cropping & Rotating)
Colour Management of Master Images
QPCard Software In DOHM Workflow
Creating Digital Collection (Organising, Creating and Connecting Metadata to Digital Objects)
Creating Checksums For Files
Mechanism To Detect Errors in Stored Files
Creating JPEG Derivatives
For Reference, Web Access, etc.

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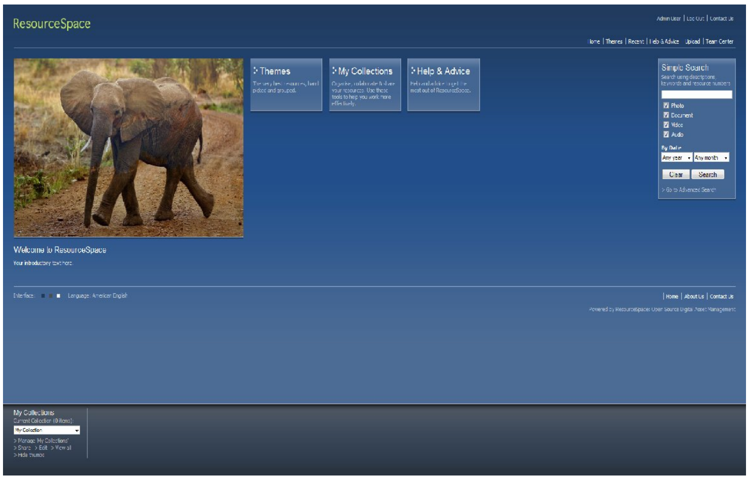
Digital Asset Management

ResourceSpace – open source, multiplatform application

(www.resourcespace.org)

ResourceSpace is one of the most user-friendly DAM open source applications currently available.


ResourceSpace
Admin User | Log Out | Contact Us
Home | Themes | Recent | Help & Advice | Upload | Team Center
Themes
My Collections
Help & Advice
Simple Search
Photo
Document
Video
Audio
By Date
Any year
Any month
Clear
Search
> Go to Advanced Search
Welcome to ResourceSpace
Your introductory text here.
Interface:
Language: American English
Home | About Us | Contact Us
My Collections
Current Collection (0 items):
My Collection

Overview

- Your users serve themselves so your **internal workload is reduced**.
- Resources are **found easily and quickly**.
- You can **respond faster** to external resource requests
- It's much easier to **send your resources** to those that need them without using up your own bandwidth: suppliers receive links via e-mail so they can download the resources themselves directly from the system.
- **Higher quality** resources are promoted so use of your best resources is encouraged.
- A centralised and well organised repository encourages the **re-use** of purchased resources.
- Only a **web browser** is needed - no cumbersome client software installations.
- **Collaboration** is encouraged through the use of shared resource collections and searches.
- Discover and respond to trends by using the detailed **reporting and statistics** functionality.
- **Open source** - released under a BSD style license and is therefore completely free of charge, and you are free to develop the product further without any restrictions.

User Benefits

- **Intuitive interface** - a visually rich, user focused interface to support you in accessing and organising your resources
- **Pure web interface** - manage and share your resources through your browser, no application install required.

- **Standards based** - works with current browsers on all the popular platforms.
- **Simple and advanced search** - the main search panel is available on every page allowing quick and intuitive access to the resources while the comprehensive advanced search lets you to focus your search and you are looking for. Use the 'search for similar' options to find other resources based on those you have selected.
- **Intelligent search ordering** - resources are scored against each keyword using user search activity
- **Resources** - detailed resource information, thumbnails and visual previews help you find the best and most relevant resources.
- **Organisation, collaboration and distribution** - tools to organise your resources, share with colleagues on projects and distribute to others; no longer any need to e-mail large files.
- **Direct access to resource files** - resources can be downloaded to your computer in a variety of sizes so your users can choose if they require high quality print files or lower quality screen / web resolution files.
- **Themes** - pre-selected groups of the best resources.
- **Page by page browsing** of PDF files using Ghostscript.

Administrator Benefits

- **Permissions** - set resource access level by user group.
- **Research services** - allows specific requests to be made to a central resources team.
- **Archiving** - resources can be archived and are then not visible in the main search.
- **User contributions** - allow your users to submit resources directly, which can then be processed by a central team before being made available to other users. Ideal for remote-working photographers.
- **Multilingual** - the application is multilingual capable with most major European languages supported.
- **Batch file editing** means it's easy to work with the metadata for large groups of resources.
- **Batch file upload** using either Flash or Java based uploaders - upload large resource sets using nothing but your web browser.
- **Automatic thumbnail creation** for hundreds of image and document types including JPEG, GIF, PNG, PDF, TIFF Photoshop PSD, InDesign, OpenOffice using ImageMagick. Support for most digital camera raw formats using dcraw.
- **Automatic video thumbnails and Flash video previews** for most video file types using FFmpeg.
- **Automatic EXIF/IPTC/XMP header import and export** using ExifTool.
- **Minimal hosting requirements** - uses PHP/MySQL technology which is supported by all major hosting providers.
- **Plugin support** - third party developers can create plugins to extend functionality.

DATA STORAGE & BACKUP

Create two or more backup copies of the image collections

Backup to removable Hard Disks, Archival Tape or CDs

Backup To be Updated Regularly

Backup Copies Stored in Controlled Conditions and Physically Remote From Each Other

Checksums to be Read Regularly to Ensure Data Validity

Plan For and Migrate Data Before End of Life of the Carrier

CDs and DVDs are not the best type of media for archival purposes

Some high quality CDs are considered being archival as they have predicted life in excess of 200 years. Experience, however, has shown that they have to be created very carefully - using high quality burners, burning at slow speed, etc.
Realistic functional life for archival CDs is about 15 to 50 years, depending on storage and use. Also, optical media is not easy to migrate.
Our current recommendation is to use external (USB or Firewire) Hard Disk Drives for archival storage and backup.
According to the Moore's Law, after 5 years the HDD's size will become impossibly small (in relation to the amount of data we'll be storing) and we would need to migrate data to a new HD. It seems like a burden having to migrate data every 5 years but migration is easy - you don't need to supervise the process. File verification is integral. It is also important to remember that data from CDs would need to be migrated in the next 10 years anyway - the CD drives will be disappearing.
With price-to-size relation of HDDs constantly improving it makes sense to purchase a new external disk every year for storage of the year's digital files. Last year file's backup should be stored on this year's drive. The cost is realtively small with prices of 1TB drive about $100.
Savings in labour (in comparison to CDs) are huge.

Be sure to choose an external hard drive with a metal housing, a fan, and an area with adequate ventilation.

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Backup

Adapted from Wikipedia, the free encyclopedia

In information technology, a **backup** or the process of **backing up** refers to making copies of data so that these additional copies may be used to *restore* the original after a data loss event. The verb is *back up* in two words, whereas the noun is *backup* (often used like an adjective in compound nouns).

Backups are useful primarily for two purposes. The first is to restore a state following a disaster (called disaster recovery). The second is to restore small numbers of files after they have been accidentally deleted or corrupted. Data loss is also very common. 66% of internet users have suffered from serious data loss.

Since a backup system contains at least one copy of all data worth saving, the data storage requirements are considerable. Organizing this storage space and managing the backup process is a complicated undertaking. A data repository model can be used to provide structure to the storage. In the modern era of computing there are many different types of data storage devices that are useful for making backups. There are also many different ways in which these devices can be arranged to provide geographic redundancy, data security, and portability.

Before data is sent to its storage location, it is selected, extracted, and manipulated. Many different techniques have been developed to optimize the backup procedure. These include optimizations for dealing with open files and live data sources as well as compression, encryption, and de-duplication, among others. Many organizations and individuals try to have confidence that the process is working as expected and work to define measurements and validation techniques. It is also important to recognize the limitations and human factors involved in any backup scheme.

Storage, the base of a backup system

Data repository models

Any backup strategy starts with a concept of a data repository. The backup data needs to be stored somehow and probably should be organized to a degree. It can be as simple as a sheet of paper with a list of all backup tapes and the dates they were written or a more sophisticated setup with a computerized index, catalog, or relational database. Different repository models have different advantages. This is closely related to choosing a backup rotation scheme.

Unstructured

An unstructured repository may simply be a stack of floppy disks or CD-R/DVD-R media with minimal information about what was backed up and when. This is the easiest to implement, but probably the least likely to achieve a high level of recoverability.

Full + incrementals

A full + incremental repository aims to make it more feasible to store several copies of the source data. At first, a *full* backup (of all files) is made. After that, any number of *incremental* backups can be made. There are many different types of incremental backups, but they all attempt to only back up a small amount of data (when compared to the size of a full backup). A incremental backup copies everything that changed after the last backup (full, differential or incremental). Restoring a whole system to a certain point in time would require locating the last full backup taken previous to that time and all the incremental backups that cover the period of time between the full backup and the particular point in time to which the system is supposed to be restored. The scope of an incremental backup is typically defined as a range of time relative to other full or incremental backups. Different implementations of backup systems frequently use specialized or conflicting definitions of these terms.

Differential backup

A differential backup copies files that have been created or changed since the last full backup. It does not mark files as having been backed up (in other words, the archive attribute is not cleared). If you are performing a combination of full and differential backups, restoring files and folders requires that you have the last full as well as the last differential backup.

Reverse delta

A reverse delta system stores the differences between current versions of a system and previous versions. A reverse delta backup will start with a normal full backup. After the full backup is performed, the system will periodically synchronize the full backup with the live copy, while storing the data necessary to reconstruct older versions. This can either be done using hard links, or using binary diffs. This system works particularly well for large, slowly changing, data sets. Examples of programs that use this method are rdiff-backup and Time Machine

Continuous data protection

Instead of scheduling periodic backups, the system immediately logs every change on the host system. This is generally done by saving byte or block-level differences rather than file-level differences. It differs from simple disk mirroring in that it enables a roll-back of the log and thus restoration of old image of data.

Full system backup

This type of backup is designed to allow an entire PC to be recovered to "bare metal" without any installation of operating system, application software and data. Most users understand that a backup will prevent "data" from being lost. The expense in a full system recovery is in the hours that it takes for a technician to rebuild a machine to the point of restoring the last data backup. So, a full system backup makes a complete image of the computer so that if needed, it can be copied back to the PC, usually using some type of bespoke software such as Ghost, and the user can carry on from that point.

Backups can be also used when installing from one operating system to another.

Storage media

Regardless of the repository model that is used, the data has to be stored on some data storage medium somewhere.

Magnetic tape

Magnetic tape has long been the most commonly used medium for bulk data storage, backup, archiving, and interchange. Tape has typically had an order of magnitude better capacity/price ratio when compared to hard disk, but recently the ratios for tape and hard disk have become a lot closer. There are myriad formats, many of which are proprietary or specific to certain markets like mainframes or a particular brand of personal computer. Tape is a sequential access medium, so even though access times may be poor, the rate of continuously writing or reading data can actually be very fast. Some new tape drives are even faster than modern hard disks. A principal advantage of tape is that it has been used for this purpose for decades (much longer than any alternative) and its characteristics are well understood.

Hard disk

The capacity/price ratio of hard disk has been rapidly improving for many years. This is making it more competitive with magnetic tape as a bulk storage medium. The main advantages of hard disk storage are low access times, availability, capacity and ease of use. External disks can be connected via local interfaces like SCSI, USB, FireWire, or eSATA, or via longer distance technologies like Ethernet, iSCSI, or Fibre Channel. Some disk-based backup systems, such as Virtual Tape Libraries, support data deduplication which can dramatically reduce the amount of disk storage capacity consumed by daily and weekly backup data. The main disadvantages of hard disk backups are that they are easily damaged, especially while being transported (e.g., for off-site backups), and that their stability over periods of years is a relative unknown.

Optical storage

Blu-ray Discs dramatically increase the amount of data possible on a single optical storage disk. Systems containing Blu-ray discs can store massive amounts of data and be more cost efficient than hard drives and magnetic tape. Some optical storage systems allow for cataloged data backups without human contact with the discs, allowing for longer data integrity. A recordable CD can be used as a backup device. One advantage of CDs is that they can be restored on any machine with a CD-ROM drive. (In practice, writable CD-ROMs are not always universally readable.) In addition, recordable CD's are relatively cheap. Another common format is recordable DVD. Many optical disk formats are WORM type, which makes them useful for archival purposes since the data can't be changed. Other rewritable formats can also be utilized such as CD-RW or DVD-RAM.

Floppy disk

During the 1980s and early 1990s, many personal/home computer users associated backing up mostly with copying to floppy disks. The low data capacity of a floppy disk makes it an unpopular and obsolete choice today.

Solid state storage

Also known as flash memory, thumb drives, USB flash drives, CompactFlash, SmartMedia, Memory Stick, Secure Digital cards, etc., these devices are relatively costly for their low capacity, but offer excellent portability and ease-of-use.

Remote backup service

As broadband internet access becomes more widespread, remote backup services are gaining in popularity. Backing up via the internet to a remote location can protect against some worst-case scenarios such as fires, floods, or earthquakes which would destroy any backups in the immediate vicinity along with everything else. There are, however, a number of drawbacks to remote backup services. First, internet connections (particularly domestic broadband connections) are generally substantially slower than the speed of local data storage devices, which can be a problem for people who generate or modify large amounts of data. Secondly, users need to trust a third party service provider with both privacy and integrity of backed up data. The risk associated with putting control of personal or sensitive data in the hands of a third party can be managed by encrypting sensitive data so that its contents cannot be viewed without access to the secret key. Ultimately the backup service must itself be using one of the above methods, so this could be seen as a more complex way of doing traditional backups.

Managing the data repository

Regardless of the data repository model or data storage media used for backups, a balance needs to be struck between accessibility, security and cost. These media management methods are not mutually exclusive and are frequently combined to meet the needs of the situation. Using on-line disks for staging data before it is sent to a near-line tape library is a common example.

On-line

On-line backup storage is typically the most accessible type of data storage, which can begin restore in milliseconds time. A good example would be an internal hard disk or a disk array (maybe connected to SAN). This type of storage is very convenient and speedy, but is relatively expensive. On-line storage is quite vulnerable to being deleted or overwritten, either by accident, by intentional malevolent action, or in the wake of a data-deleting virus payload.

Near-line

Near-line storage is typically less accessible and less expensive than on-line storage, but still useful for backup data storage. A good example would be a tape library with restore times ranging from seconds to a few minutes. A mechanical device is usually involved in moving media units from storage into a drive where the data can be read or written. Generally it has safety properties similar to on-line storage.

Off-line

Off-line storage requires some direct human action in order to make access to the storage media physically possible. This action is typically inserting a tape into a tape drive or plugging in a cable that allows a device to be accessed. Because the data is not accessible via any computer except during limited periods in which it is written or read back, it is largely immune to a whole class of on-line backup failure modes. Access time will vary depending on whether the media is on-site or off-site.

Off-site data protection

To protect against a disaster or other site-specific problem, many people choose to send backup media to an off-site vault. The vault can be as simple as a system administrator's home office or as sophisticated as a disaster hardened, temperature controlled, high security bunker that has facilities for backup media storage. Importantly a data replica *can* be off-site but also *on-line* (e.g., an off-site RAID mirror). Such a replica has fairly limited value as a backup, and should not be confused with an off-line backup.

Backup site or disaster recovery center (DR center)

In the event of a disaster, the data on backup media will not be sufficient to recover. Computer systems onto which the data can be restored and properly configured networks are necessary too. Some organizations have their own data recovery centers that are equipped for this scenario. Other organizations contract this out to a third-party recovery center. Because a DR site is itself a huge investment, backing up is very rarely considered the preferred method of moving data to a DR site. A more typical way would be remote disk mirroring, which keeps the DR data as up to date as possible.

Advice

- The more important the data is that is stored on the computer, the greater is the need for backing up this data.
- A backup is only as useful as its associated restore strategy. For critical systems and data, the restoration process must be tested.
- Storing the copy near the original is unwise, since many disasters such as fire, flood, theft, and electrical surges are likely to cause damage to the backup at the same time. In these cases, both the original and the backup medium are likely to be lost.
- Automated backup and scheduling should be considered, as manual backups can be affected by human error.
- Backups can fail for a wide variety of reasons. A verification or monitoring strategy is an important part of a successful backup plan.
- Multiple backups on different media, stored in different locations, must be used for all critical information.
- Backed up archives should be stored in open and standard formats, especially when the goal is long-term archiving. Recovery software and processes may have changed, and software may not be available to restore data saved in proprietary formats.
- System administrators and others working in the information technology field are routinely fired for not devising and maintaining backup processes suitable to their organization.
- If you already have a tape backup system, a second backup program may be necessary, do an additional backup to the external hard disk with an automatic backup program, you will have the double data security, and it is easy to check the backed up files in the external hard disk.

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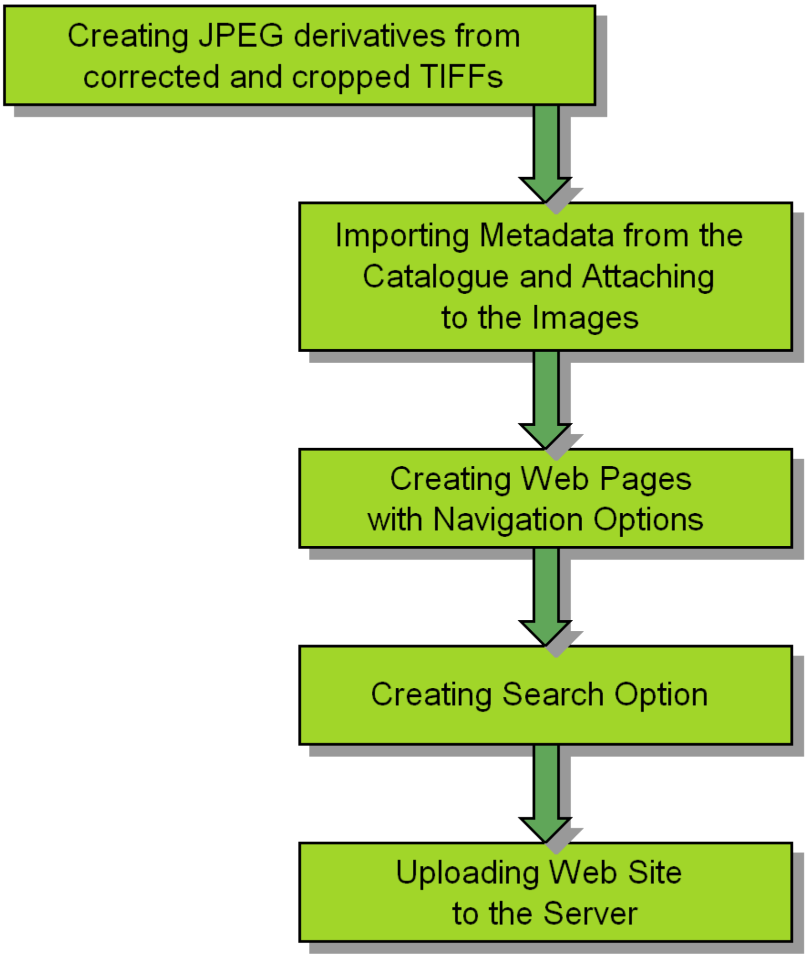
CREATING ACCESS


Creating JPEG derivatives from corrected and cropped TIFFs
Importing Metadata from the Catalogue and Attaching to the Images
Creating Web Pages with Navigation Options
Creating Search Option
Uploading Web Site to the Server

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Creating Access

Every digital collection needs to be accessible in order to be useful. Access has to be provided according to specific collection rules, which allow search, retrieving digital objects and regulating access to restricted items.

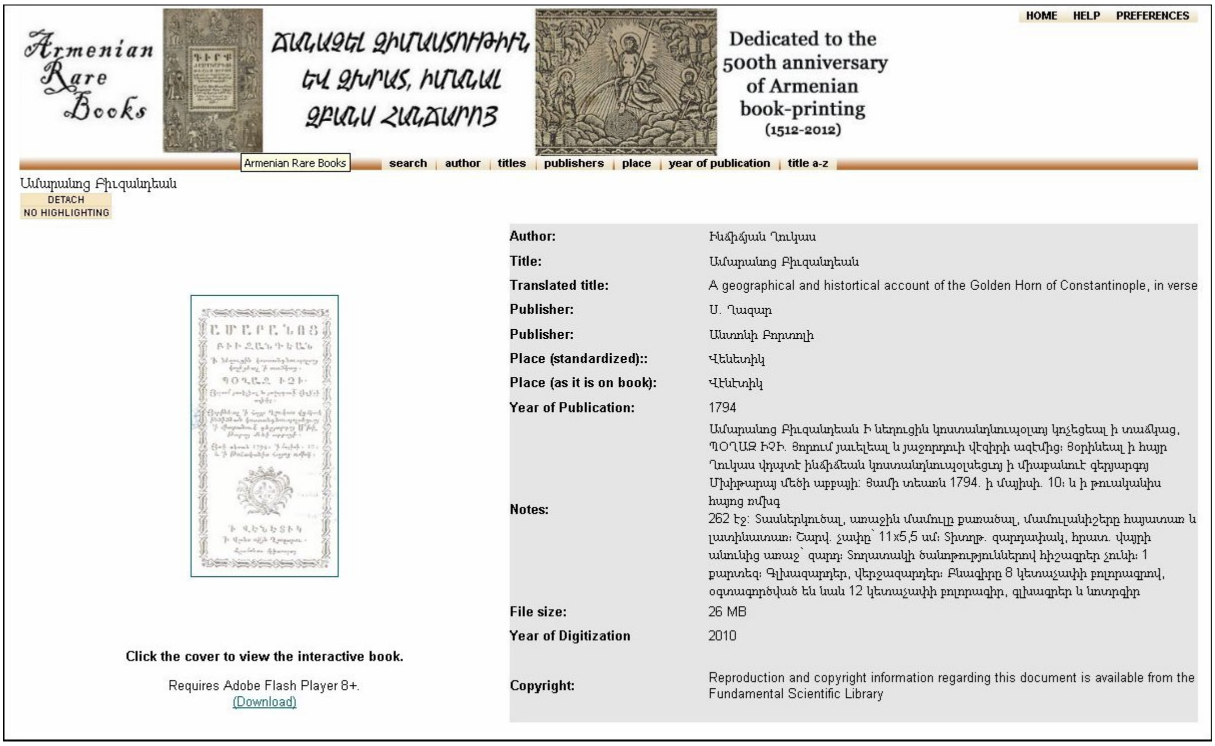
According to National Information Standards Organization (NISO, *A Framework of Guidance for Building Good Digital Collections, Dec 2007*):

> "Collections should be described so that a user can discover characteristics of the collection, including scope, format, restrictions on access, ownership, and any information significant for determining the collection's authenticity, integrity, and interpretation."

To create a robust digital delivery system is no easy task. It requires many complex systems working together. Often, it is part of a larger, digital repository structure.

Usually, small organisations are not capable of setting up such systems and need to simplify them in order to provide access. One of the best solutions is Greenstone, an open source (free) digital library for building and distributing digital collections. It requires some technical skills to set it up but is quite powerful and flexible. The home page for Greenstone can be found at http://www.greenstone.org

Greenstone example: *Armenian Rare Books*



Ամարանոց Բիւզանդեան

Author:	Ինճիճյան Ղուկաս
Title:	Ամարանոց Բիւզանդեան
Translated title:	A geographical and historical account of the Golden Horn of Constantinople, in verse
Publisher:	Մ. Ղազար
Publisher:	Անտոնի Բորտոլի
Place (standardized)::	Վենետիկ
Place (as it is on book):	Վէնէտիկ
Year of Publication:	1794
Notes:	Ամարանոց Բիւզանդեան Ի նեղուցին կոստանդնուպօլսոյ կոչեցեալ ի տաճկաց, ՊՕՂԱՁ ԻՉԻ. Յորում յաւելեալ և յաջորդուի վէզիրի ազէմից: Յօրինեալ ի հայր Ղուկաս վրդպտէ ինճիճեան կոստանդնուպօլսեցւոյ ի միաբանուէ գերյարգոյ Մխիթարայ մեծի աբբայի: Յամի տեառն 1794. ի մայիսի. 10: և ի թուականին հայոց ռմխգ 262 էջ: Տասներկուծալ, առաջին մամուլը քառածալ, մամուլանիշերը հայատառ և լատինատառ: Ճարվ. չափը` 11x5,5 սմ: Տիտղթ. զարդափակ, հրատ. վայրի անունից առաջ` զարդ: Տողատակի ծանոթություններով հիշագրեր չունի: 1 քարտեզ: Գլխազարդեր, վերջազարդեր: Բնագիրը 8 կետաչափի բոլորագրով, օգտագործված են նաև 12 կետաչափի բոլորագիր, գլխագրեր և նոտրգիր
File size:	26 MB
Year of Digitization	2010
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DIGITAL PRESERVATION

Adapted form Wikipedia, the free encyclopedia

Digital preservation is the active management of digital information over time to ensure its accessibility. Preservation of digital information is widely considered to require more constant and ongoing attention than preservation of other media. This constant input of effort, time, and money to handle rapid technological and organizational advance is considered the main stumbling block for preserving digital information. Indeed, while we are still able to read our written heritage from several thousand years ago, the digital information created merely a decade ago is in serious danger of being lost, creating a digital Dark Age.

Digital preservation is the set of processes and activities that ensure continued access to information and all kinds of records, scientific and cultural heritage existing in digital formats. This includes the preservation of materials resulting from digital reformatting (e.g. digitised photographs or books), but particularly information that is born-digital and has no analogue counterpart. In the language of digital imaging and electronic resources, preservation is no longer just the product of a program but an ongoing process. In this regard the way digital information is stored is important in ensuring its longevity. The long-term storage of digital information is assisted by the inclusion of preservation metadata (preservation metadata stores technical details on the format, structure and use of the digital content, the history of all actions performed on the resource including changes and decisions, the authenticity information such as technical features or custody history, and the responsibilities and rights information applicable to preservation actions).

Digital preservation is defined as: long-term, error-free storage of digital information, with means for retrieval and interpretation, for the entire time span the information is required for. Long-term is defined as "long enough to be concerned with the impacts of changing technologies, including support for new media and data formats, or with a changing user community. Long Term may extend indefinitely". "Retrieval" means obtaining needed digital files from the long-term, error-free digital storage, without possibility of corrupting the continued error-free storage of the digital files. "Interpretation" means that the retrieved digital files, files that, for example, are of texts, charts, images or sounds, are decoded and transformed into usable representations. This is often interpreted as "rendering", i.e. making it available for a human to access. However, in many cases it will mean, able to be processed by computational means.

Why active preservation is necessary

Society's heritage has been presented on many different materials, including stone, vellum, bamboo, silk, and paper. Now a large quantity of information exists in digital forms, including emails, blogs, social networking websites, national elections websites, web photo albums, and sites which change their content over time. According to a report by the US Library of Congress, 44% of the sites available on the internet in 1998 had vanished one year later.

The unique characteristic of digital forms makes it easy to create content and keep it up-to-date, but at the same time brings many difficulties in the preservation of this content. Margaret Hedstrom points out that "...digital preservation raises challenges of a fundamentally different nature which are added to the problems of preserving traditional format materials."

Physical deterioration

The media on which digital contents are stored are more vulnerable to deterioration and catastrophic loss than some analog media such as paper. While acid paper is prone to deterioration, becoming brittle and yellowing with age, the deterioration may not become apparent for some decades and progresses slowly. It remains possible to retrieve information without loss once deterioration is noticed. Digital data recording media may deteriorate more rapidly and once the deterioration starts, in most cases there may already be data loss. This characteristic of digital forms leaves a very short time frame for preservation decisions and actions.

Digital obsolescence

Another challenge is the issue of long-term access to data. Digital technology is developing quickly and retrieval and playback technologies can become obsolete in a matter of years. When faster, more capable and less expensive storage and processing devices are developed, older versions may be quickly replaced. When software or decoding technology is abandoned, or a hardware device is no longer in production, records created with such technologies are at great risk of loss, simply because they are no longer accessible. This process is known as digital obsolescence.

This challenge is exacerbated by a lack of established standards, protocols and proven methods for preserving digital information. We used to save copies of data on tapes, but media standards for tapes have changed considerably over the last five to ten years, and there is no guarantee that tapes will be readable in the future. Recovering these materials may require special tools. Hedstrom further explained that almost all digital library researches have been focused on "...architectures and systems for information organization and retrieval, presentation and visualization, and administration of intellectual property rights" and that "...digital preservation remains largely experimental and replete with the risks associated with untested methods".

Strategies

In 2006, the Online Computer Library Center developed a four-point strategy for the long-term preservation of digital objects that consisted of:

* Assessing the risks for loss of content posed by technology variables such as commonly used proprietary file formats and software applications.
* Evaluating the digital content objects to determine what type and degree of format conversion or other preservation actions should be applied.

- Determining the appropriate metadata needed for each object type and how it is associated with the objects.
- Providing access to the content.

There are several additional strategies that individuals and organizations may use to actively combat the loss of digital information.

Refreshing

Refreshing is the transfer of data between two types of the same storage medium so there are no bitrate changes or alteration of data. For example, transferring census data from an old preservation CD to a new one. This strategy may need to be combined with migration when the software or hardware required to read the data is no longer available or is unable to understand the format of the data. Refreshing will likely always be necessary due to the deterioration of physical media.

Migration

Migration is the transferring of data to newer system environments (Garrett et al., 1996). This may include conversion of resources from one file format to another (e.g., conversion of Microsoft Word to PDF or OpenDocument), from one operating system to another (e.g., Windows to Linux) or from one programming language to another (e.g., C to Java) so the resource remains fully accessible and functional. Resources that are migrated run the risk of losing some type of functionality since newer formats may be incapable of capturing all the functionality of the original format, or the converter itself may be unable to interpret all the nuances of the original format. The latter is often a concern with proprietary data formats.

The US National Archives Electronic Records Archives and Lockheed Martin are jointly developing a migration system that will preserve any type of document, created on any application or platform, and delivered to the archives on any type of digital media. In the system, files are translated into flexible formats, such as XML; they will therefore be accessible by technologies in the future. Lockheed Martin argues that it would be impossible to develop an emulation system for the National Archives ERA because the volume of records and cost would be prohibitive.

Replication

Creating duplicate copies of data on one or more systems is called replication. Data that exists as a single copy in only one location is highly vulnerable to software or hardware failure, intentional or accidental alteration, and environmental catastrophes like fire, flooding, etc. Digital data is more likely to survive if it is replicated in several locations. Replicated data may introduce difficulties in refreshing, migration, versioning, and access control since the data is located in multiple places.

Emulation

Emulation is the replicating of functionality of an obsolete system. Examples include emulating an Atari 2600 on a Windows system or emulating WordPerfect 1.0 on a Macintosh. Emulators may be built for applications, operating systems, or hardware platforms. Emulation has been a popular strategy for retaining the functionality of old video game systems, such as with the MAME project. The feasibility of emulation as a catch-all solution has been debated in the academic community. (Granger, 2000)

Raymond A. Lorie has suggested a Universal Virtual Computer (UVC) could be used to run any software in the future on a yet unknown platform. The UVC strategy uses a combination of emulation and migration. The UVC strategy has not yet been widely adopted by the digital preservation community.

Jeff Rothenberg, a major proponent of Emulation for digital preservation in libraries, working in partnership with Koninklijke Bibliotheek and National Archief of the Netherlands, has recently helped launch Dioscuri, a modular emulator that succeeds in running MS-DOS, WordPerfect 5.1, DOS games, and more.

Metadata attachment

Metadata is data on a digital file that includes information on creation, access rights, restrictions, preservation history, and rights management. Metadata attached to digital files may be affected by file format obsolescence. ASCII is considered to be the most durable format for metadata because it is widespread, backwards compatible when used with Unicode, and utilizes human-readable characters, not numeric codes. It retains information, but not the structure information it is presented in. For higher functionality, SGML or XML should be used. Both markup languages are stored in ASCII format, but contain tags that denote structure and format.

Trustworthy digital objects

Digital objects that can speak to their own authenticity are called trustworthy digital objects (TDOs). TDOs were proposed by Henry M. Gladney to enable digital objects to maintain a record of their change history so future users can know with certainty that the contents of the object are authentic.Other preservation strategies like replication and migration are necessary for the long-term preservation of TDOs.

Digital preservation standards

To standardize digital preservation practice and provide a set of recommendations for preservation program implementation, the Reference Model for an Open Archival Information System (OAIS) was developed. The reference model (ISO 14721:2003) includes the following responsibilities that an OAIS archive must abide by:

* Negotiate for and accept appropriate information from information Producers.

* Obtain sufficient control of the information provided to the level needed to ensure Long-Term Preservation.
* Determine, either by itself or in conjunction with other parties, which communities should become the Designated Community and, therefore, should be able to understand the information provided.
* Ensure that the information to be preserved is Independently Understandable to the Designated Community. In other words, the community should be able to understand the information without needing the assistance of the experts who produced the information.
* Follow documented policies and procedures which ensure that the information is preserved against all reasonable contingencies, and which enable the information to be disseminated as authenticated copies of the original, or as traceable to the original.
* Make the preserved information available to the Designated Community.

Preservation Links

- What is Digital Preservation - http://www.digitalpreservationeurope.eu/what-is-digital-preservation/

- Digital Preservation - http://www.diglib.org/preserve.htm

- Digital Preservation at the NLA - http://www.nla.gov.au/preserve/digipres/index.html

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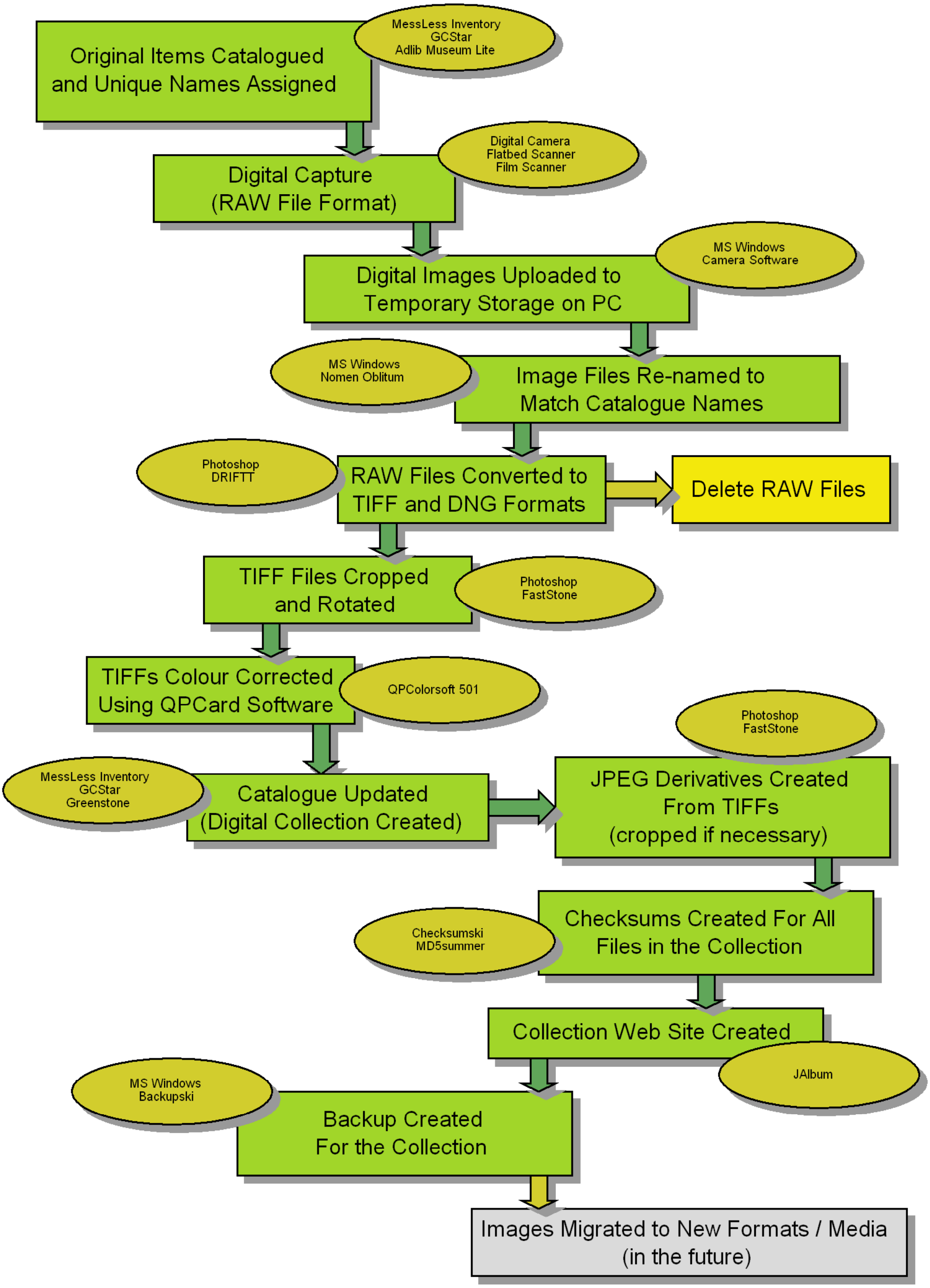
DOHM ARCHIVING WORKFLOW


Original Items Catalogued and Unique Names Assigned
MessLess Inventory
GCStar
Adlib Museum Lite
Digital Capture (RAW File Format)
Digital Camera
Flatbed Scanner
Film Scanner
Digital Images Uploaded to Temporary Storage on PC
MS Windows
Camera Software
MS Windows
Nomen Oblitum
Image Files Re-named to Match Catalogue Names
Photoshop
DRIFTT
RAW Files Converted to TIFF and DNG Formats
Delete RAW Files
TIFF Files Cropped and Rotated
Photoshop
FastStone
TIFFs Colour Corrected Using QPCard Software
QPColorsoft 501
Photoshop
FastStone
MessLess Inventory
GCStar
Greenstone
Catalogue Updated (Digital Collection Created)
JPEG Derivatives Created From TIFFs (cropped if necessary)
Checksumski
MD5summer
Checksums Created For All Files in the Collection
Collection Web Site Created
JAlbum
MS Windows
Backupski
Backup Created For the Collection
Images Migrated to New Formats / Media (in the future)

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ADDITIONAL MATERIAL

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CAPTURE YOUR COLLECTIONS: SMALL MUSEUM VERSION

a collaboration between

CHIN training and AMOL Australian Museums & Galleries Online

GLOSSARY

35mm equivalent
Field of view on a digital camera stated as an equivalent focal length on a 35mm film camera. For example, a 5mm lens on a digital camera is equivalent to a 36mm lens in the 35mm system.

additive colours
Red, green and blue (RGB), the colours of light used in monitors and scanners, which give the perception of white when added together.

algorithm
A rule (often mathematical) governing computer processes; here, those used in file compression.

A-D Converter
The analogue to digital converter converts the analogue signal originating from the image sensor in a digital camera or scanner to a digital signal.

archival image
A digital image, also referred to as a master image, that has been captured at the highest practicable quality or resolution and stored for long-term usage. Archival images are normally stored in an off-line mode on tape or CD and are accessed only for the production of surrogate or derivative images.

area array
A common type of detector (see CCD and CMOS) arrangement within a digital camera; contains a fixed number of horizontal and vertical pixels.

artifacts
Visual digital effects introduced into an image by electrical noise during the capture process or over-compression that do not correspond to the original image being scanned. Artifacts might include pixellation, dotted or straight lines, regularly repeated patterns, moiré, etc.

autofocus
The camera automatically focuses on the object to capture at which it is pointed; this object then becomes the sharpest part of the overall image.

automatic sheet feeder
A device attached to a scanner, printer or photocopier that makes it possible to process large numbers of documents automatically.

bandwidth
The transmission capacity of a communications channel; data speed measured in bits per

second. A high-bandwidth network is required for fast transfer of image files, as they typically contain large amounts of data.

benchmark
A set of tests normally done during the feasibility study, to determine the technical standards to which the material should be digitised. Quality assurance procedures should measure the digitized images against these benchmarks.

bit
Short for binary digit, the smallest unit of data in computer processing. A bit can represent two values: on and off, or 1 and 0.

bit depth
Also referred to as colour depth is the number of bits used to describe the colour of each pixel. Greater bit depth allows a greater range of colours or shades of grey to be represented by a pixel, e.g.:

- 1 bit is black or white (on or off)
- 8-bit grayscale is 256 shades of grey
- 8-bit colour is 256 colours
- 16-bit colour is 65,536 colours
- 24-bit colour resolution is 16.7 million colours
- 30-bit or higher colour is billions of colours

bitmap graphic
Also referred to as a raster graphic; a method of storing information that maps an image pixel. The bitmap image consists of rows of pixels.

BMP
Standard image format on DOS and Windows-compatible computers. The BMP format supports RGB, indexed-colour, greyscale, and bitmap colour modes.

brightness adjustment
The addition or subtraction of white light to a colour.

brightness resolution
Defines to what **resolution** a single pixel's intensity can be expressed

byte
A group of 8 bits, the basic unit of information for the computer.

calibration
The process of adjusting the colour of one device relative to another, such as a monitor to a printer, or a scanner to a film recorder, or the process of adjusting the colour of one device to some established standard.

capture devices
These include flatbed scanners, drum scanners, film scanners, digital cameras. They use electronic devices rather than photographic film to capture images.

CCD
Charge-Coupled Device; a light-sensitive chip or image sensor used in scanners and digital cameras that converts light into proportional (analogue) electrical current. The A-D converter converts analogue signals into pixel values.

CCITT Group III or Group IV
The standards adopted by the International Telecommunications Union (ITU), formerly the

Comité consultatif international de télégraphique et téléphonie (CCITT), to compress text page images. All fax machines in common use employ one or both of these standards.

CD-ROM
Compact Disc Read-Only Memory. A form of write-once, disc-based, random-access data storage, usually mass-produced and distributed as a publication. At present, capable of holding approximately 640 megabytes of data.

CMD
Charge Modulated Device, an active image sensor derived from CCD pixel technology and CMOS transistor technology.

CMOS
Complementary Metal Oxide Semiconductor is another type of image sensor found in a digital camera. Pixel sensitivity is lower than the CCD sensors and usually has more noise in the imaging device.

CMS
Colour Management System; a collection of software tools designed to produce consistency in the representation of different colour capabilities of scanners, monitors and printers to ensure consistent colour throughout the image production process.

CMYK
A colour model using cyan, magenta and yellow pigments as the subtractive primary colours along with black (K), used primarily in the printing process. Combining the CMY inks at full saturation renders black (subtracting all colours).

colour accuracy
Fidelity of the scanned image's colour to that of the original.

colour correction
Altering colours as they appear in a digital image or in print to ensure that they accurately represent the work depicted.

colour depth
Also referred to as bit depth is the number of bits used to describe the colour of each pixel. Greater bit depth allows a greater range of colours or shades of grey to be represented by a pixel, e.g.:

- 1 bit is black or white (on or off)
- 8-bit grayscale is 256 shades of grey
- 8-bit colour is 256 colours
- 16-bit colour is 65,536 colours
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- 30-bit or higher colour is billions of colours

colour look-up table
A table containing the RGB values for 256 colours. Storage space is saved as an 8-bit number links each image pixel to a RGB value held in the table rather than having each pixel hold a 24-bit description of its colour.

colour separation
A process of converting full-colour images into a limited number of primary colors. Additive primary colours (red, green and blue) are used by the scanner, and the subtractive primary colours (cyan, magenta and yellow) plus black are used for printing press colour separation.

colour space
Mathematical definitions of colour used for aiding communication of colour information; means of representing the spectrum.

compactFlash
Electronic memory used in digital cameras, USB sticks and other devices. The CompactFlash can be erased when the files have been transferred or are no longer needed.

compression
An algorithm applied to a digital image to reduce its file size. Compression techniques are distinguished by whether they remove detail and colour from the image. Lossless techniques compress image data without removing detail; lossy techniques compress images by removing detail.

continuous tone
An image whose brightness appears consistent and uninterrupted. Each pixel in a continuous-tone image file uses at least one byte each for its red, green and blue values. This permits 256 density levels per colour, or more than 16 million colours.

cropping
A method of discarding extraneous material from a digital image e.g. borders created during the scanning process.

derivative image
An image that has been created from another image, such as the archival image, through some kind of image editing process to create a user or working copy. The process usually involves a loss of information to reduce the size by sampling it to a lower resolution, using lossy compression techniques, or altering an image using image processing techniques.

descreening
Software functions build in to some scanning software applications to reduce or eliminate moiré patterning (unattractive stripes or diamond patterns appearing on the scan).

device driver
A software utility designed to tell a computer how to operate an external device: for instance, to operate a printer or a scanner, a computer will need a specific driver.

digital camera
A camera that contains no film but records images as digital objects which can then be downloaded into a computer for further processing.

digital image
A matrix or image composed of pixels whose locations hold digital colour and/or brightness information which, when viewed at a suitable distance, form an image.

digital imaging
A term generally used to describe the process of creating and manipulating digital images.

digital preservation
The long-term maintenance and upgrade of digital files on digital storage medium

digital watermark
A visible or invisible watermark that is applied to a digital image such that ownership of the image is known.

digital zoom
An electronic enlargement of part of the image making it appear closer and bigger,

simulating a telephoto lens. The image is actually being cropped, resulting in loss of surrounding pixels and resolution. In some digital cameras and scanners, interpolation is used to offset this loss.

digitisation
Also referred to as image capture, is the process of creating a digital representation or image of an original through scanning or digital photography.

dithering
A process in which software or an output device simulates continuous tones with groups of dots.

DPI
Dots per inch; measurement of the scanning resolution of an image or the quality of an output device. DPI expresses the number of dots a printer can print per inch, or that a monitor can display, both horizontally and vertically.

drum scanner
A high-quality image-capture device. The image to be captured is wrapped around a drum that spins very fast while a light source scans across it to capture a digital version of the image.

dye sublimation
A type of printing process in which a dye ribbon is heated by the print head, creating a gas that hardens onto special paper. This creates soft-edged spots of colour that melt into each other and give the appearance of a continuous-tone photograph.

dynamic range
The ratio of the saturation to noise, limited by the bit depth of the sensor. Dynamic range is expressed numerically (3.0, for example). In the captured image the dynamic range relates to the colour fidelity and contrast range of the picture. The greater the dynamic range, the higher the contrast and colour bit depth.

file
A collection of information, such as text, data or images saved on a storage device such as a disk or hard drive.

file format
A type of format for encoding the information in a data file. Some common image file formats include TIFF, JPG, and BMP.

film scanner
Scanner specifically designed for capturing transparent film formats such as 35mm film by mounting film in a holder that may be automatically drawn through the device.

FireWire
A very fast external bus that supports data transfer rates of up to 400 Mbps developed by Apple, FireWire falls under the IEEE 1394 standard.

fixed focus
The camera's focus is pre-set to a distance at which most subjects or objects will be in focus. Not as precise as autofocus.

FlashPix
An image format developed by Kodak, Hewlett-Packard, Live Picture and Microsoft which offers multiple-resolution storage, and JPEG compression.

flatbed scanner
An image-capture device in which the source material remains stationary while the sensor (usually a CCD linear array) passes over or under it. Sometimes called a reflective scanner.

focal length equivalency
Lens specifications for digital cameras given in 35mm camera lens equivalents (since most users are familiar with 35mm lenses).

gamma
The relationship between the voltage input and the brightness of a monitor. An important factor in calibration as monitors have to compensate for gamma to get the desired on-screen grey values. The standard gamma on Windows is 2.2, and on Mac 1.8.

gamut
The total range of colours reproduced by a device. A colour is said to be "out of gamut" when its position in one device's colour space cannot be directly translated into another device's colour space. A typical CMYK gamut is generally smaller than a typical RGB gamut.

GIF
Graphic Image File format, a widely supported image-storage format promoted by CompuServe that gained early widespread use on online services and the Internet. Resolution is limited to 8-bits, or 256 colours. GIF89a is a more recent format that supports interlacing.

gigabyte (GB)
A measure of computer memory or disk space consisting of about one thousand million bytes (a thousand megabytes). The actual value is 1,073,741,824 bytes (1,024 megabytes).

grey scale
The brightness of a pixel expressed as a value representing it's lightness from black to white: Usually defined as a value from 0 to 255, with 0 being black and 255 being white. A term used to describe an image containing shades of grey as well as black and white.

halftone image
An image reproduced by means of a special screen made up of dots of various sizes to simulate shades of grey in a photograph; typically used for newspaper or magazine reproduction of images.

histogram
An analysis tool consisting of a bar graph that can be used to identify contrast and dynamic range image problems. Histograms are found in high-end imaging software used to manipulate digital images.

hue
Used to describe the entire range of colours of the spectrum; the component that determines just what colour is being used.

ICC
International Colour Consortium established by industry vendors to create, promote and encourage the standardization and evolution of an open vendor-neutral, cross-platform colour management system architecture.

ICC device profile
A file that describes how a particular device (e.g., monitor, scanner, printer) reproduces colour in its specific colour space. Profiles can be either generic or custom.

image capture
Also referred to as digitisation, is the process of creating a digital representation or image of an original through scanning or digital photography.

image database
Computer system where image files are kept in an organised form. Software that facilitates organised storage and retrieval of digital images.

image formats
A type of format for encoding the information in a data file. Some common image file formats include TIFF, JPG, and BMP.

image manipulation
Modification of images such as tonal adjustments, cropping, moiré reduction, etc. using image editing software.

ImagePac
A widely used proprietary image file format developed by Kodak, designed specifically for storing photographic-quality images on CD.

image processing
Capturing and manipulating images to enhance or extract information.

image sensor
An electronic device capable of reacting to the impact of photons, converting them to an electrical current that is then passed on to the A-D converter. The most commonly image sensors used in digital imaging are CCD, CMD and CMOS.

indexed colour
Reduced colour mapping, 8 bit or less; done to reduce images to their smallest size. Commonly used for images placed on Internet pages. The 256-colour palette are also mapped for best results on the Internet, taking into account the differences between the Windows and Macintosh colour palettes.

inkjet printer
A type of printer that sprays dots of ink onto paper to create an image. Inkjet printers are normally inexpensive. Better-quality inkjet printers can attain near photo quality output.

interpolation
A process normally used in scanners and digital cameras to increase the image size in pixels by averaging the values of surrounding pixels.

ISO equivalency
The sensitivity rating for film or CCDs defined by the International Organization for Standardization (ISO). Digital cameras have fixed ISO equivalents or can be set to sensitivities ranging from 80 to 640 to achieve adequate exposure under different lighting conditions.

interface
A piece of hardware, a method, or a standard used for connection between or among computer devices.

JPEG
Joint Photographic Experts Group. Common format for displaying images on the Web. JFIF (JPEG File Interchange Format) is the actual file format used to compress an image with the JPEG method which is a standard developed for still-image compression sanctioned by the International Standards Organization (ISO).

jukebox
A peripheral device connected to a computer that can hold a number of optical disks or magnetic tapes at a time, making it possible to switch among them at will.

kilobyte (K)
An amount of computer memory, disk space, or document size consisting of approximately one thousand bytes: Actual value is 1024 bytes. Often used to refer to file sizes.

Lab colour
A colour model developed by the International Consortium on Illumination. The Lab model, like other CIE colour models, defines colour values mathematically in a device-independent manner. Lab colour is consistent colour regardless of the device producing it.

laser printer
A printer using laser copier technology to produce high-quality printed material from computer data. The laser charges an electrostatically sensitive drum to accept carbon-based toners which are then transferred and fused to paper or transparency material.

LCD monitor
The liquid crystal display colour screen on most digital cameras, usually 1.8 to 2.5 inches measured diagonally; used to check images after they are shot. The LCD monitor is usually more accurate than an optical viewfinder, though not as convenient to use.

lossless compression
A compression algorithm that reduces the storage space needed for an image file without real loss of data. The uncompressed image can be reconstructed to be identical to the original. Continuous-tone images will on the average be reduced to half the original size.

lossy compression
A compression algorithm that reduces file size by actually removing data from the image. The most effective lossy-compression algorithms work by discarding information that is not easily perceptible to the human eye. Effective compression ratios of 10:1 to 50:1 can be attained.

LPI (lines per inch)
The number or density of horizontal and vertical lines in a halftone screen.

LZW
Lempel-Ziv-Welch is a proprietary lossless data-compression algorithm used in GIF and TIFF files.

macro lens
A digital camera lens mode that allows one to get very close to objects so that they appear greatly enlarged in the picture.

manual focus
Digital camera focus that can be manually be set at any point from near to far or in steps such as 3 feet, 15 feet, or infinity. Also provided as an override feature on some autofocus.

master image
A digital image, also referred to as a master image, that has been captured at the highest practicable quality or resolution and stored for long-term usage. Archival images are normally stored in an off-line mode on tape or CD and are accessed only for the production of surrogate or derivative images.

megabyte (MB)
An amount of computer memory consisting of about one million bytes: The actual value is 1,048,576 bytes.

megapixel
The measure of the resolution of a digital camera with an image sensor capable of capturing one million pixels.

memory
Commonly used to refer to a component in a electronic system that stores information for future use.

meta-data
Data about data, or information known about the image in order to provide access to the image. Usually includes information about the intellectual content of the image, digital representation data, and security or rights management information.

migration
Preserving the integrity of digital images by transferring them across hardware and software configurations and across subsequent generations of computer technology as a means of preservation and access.

moiré
A visible pattern that occurs when one or more halftone screens are misregistered in a colour image.

noise
Data or unidentifiable marks that may appear as bright specks in dark areas of a scan owing to electrical interference in the CCD sensor and associated circuitry.

OCR
Optical Character Recognition. The technology that allows computers to 'read' text from physical objects. OCR requires a graphical representation of text to interpret, which usually comes from a scanned image.

optical resolution
The true resolution of an image sensor based on the number of photosites on the surface of the image sensor without recourse to interpolation.

optical viewfinder
An optical glass device on the digital camera which, when looked through, shows the image to be photographed. The best digital cameras have both optical viewfinders and LCD monitors.

optical zoom
A zoom lens that uses movement of lens elements to achieve various fields of view. Regardless of whether the zoom is set for wide angle or telephoto viewing, the resolution of the image remains the same.

palette
The set of colours that appear in a particular digital image. Becomes part of a colour look-up table.

PCX
Image file format commonly used in the past by IBM PC-compatible computers.

photographic film
Substrate coated with emulsion containing light sensitive silver halide grains.

PhotoCD
Compact disk-type storage technology developed by Kodak. Five levels of image quality are stored for each image in an Imagepac on a PhotoCD disc. Discontinued.

PhotoShop
PhotoShop is a widely used image editing application from Adobe, often used as a benchmark for other imaging applications.

photosite
A small area on the surface of an image sensor that captures the brightness for a single pixel in the image. There is one photosite for every pixel in the image.

PICT
A graphics file format widely used among Macintosh graphics and page-layout applications as an intermediary file format for transferring files between applications.

pixel
Short for picture element; the smallest unit that makes up an image. Each pixel can represent a number of different shades or colours, depending on how much storage space is allocated for it. Also used in measuring image size and resolution.

pixellation
Occurs when an image is enlarged (by zooming in) as each pixel in the image will take up two (or more) pixels on the display. This leads to the image having steps on edges that are anything other than horizontal or vertical. Also referred to as 'jaggies'.

PNG
Portable Network Graphics; a standard file format approved by the World Wide Web consortium to replace the GIF file format. PNG is patent and license-free.

PostScript
A page description language developed by Adobe Systems, Inc. to control precisely how and where shapes and type will appear on a page. Software and hardware may be described as being PostScript compatible.

PPI
Pixels per inch; measurement used to describe the size of the final printed image. An image that has a higher number of pixels per inch will show more detail than one which has fewer pixels per inch.

quality assurance (QA)
Also referred to as quality control; the monitoring of systems and processes to ensure that the quality of work is within defined tolerances.

RAM
Random Access Memory; the volatile memory used to store information temporarily during processing. RAM is used in most processors in computers, digital cameras, printers, etc.

raster graphics
Also referred to as bitmap images; an image composed of pixels or an image represented with a matrix of dots.

refreshing
Transferring digital data to new storage media to avoid the effects of media deterioration.

resampling
Changing the resolution of an image by increasing or decreasing the number of pixels.

resizing
To alter the resolution or the horizontal or vertical size of an image.

resolution
Spatial resolution, normally expressed as the number of pixels per linear unit e.g., 300 ppi (pixels per inch), sometimes dpi (dots per inch) or spi (samples per inch). For colour resolution see Bit Depth.

RGB
An additive colour model in which red, green and blue light is combined to create colours, combining full intensities of all three makes white. Digital cameras, scanners and monitors use RGB to record and display colours.

RLE
Run Length Encoding is a lossless compression format primarily used with Windows files (BMP, PCX). RLE supports only 256 colours.

ROM
Read Only Memory; memory that can be read but not updated or changed. Memory that is nonvolatile and does not disappear when power is shut off. Commonly used in computers and CD formats such as CD-ROMs.

scan area
The maximum dimensions of the area in a flatbed scanner in which an original can be placed for scanning.

scanner
A device for capturing a digital image. There are many types of scanners, such as flatbed scanners, drum scanners, film scanners and microfilm scanners.

scanning area array
A hybrid of scanning linear array and area array used to describe the arrangement of the detector within a digital camera.

scanning linear array
A way in which the detector within a digital camera can be arranged resulting in high resolution images.

terabyte (TB)
A measure of computer memory or disk space consisting of about one trillion bytes (a thousand gigabytes). The actual value is 1,099,511,627,776 bytes.

SCSI
Small Computer Serial Interface. A system of connecting a chain of computer peripherals to a computer.

serial port
A data transfer method used to connect a peripheral, such as a digital camera, to a computer. The serial connection will allow the peripheral to transfer data to the computer and vice versa. Not very commmon in modern computers.

sharpening
A software method of exaggerating edges in an image to give enhanced definition.

software
Written coded commands that tell a computer what tasks to perform. For example, Word, PhotoShop, Picture Easy, and PhotoDeluxe are software programs.

spatial resolution
Describes how much detail in a photographic image is visible to the human eye. High-resolution images are sharp and more details are visible.

storage device
A device such as a magnetic disc, CD or tape used to store and retrieve digital files.

subtractive colours
The colour pigments cyan, magenta and yellow (CMY), which produce black when mixed in certain amounts. In printing, black is often added to give more definition, as mixing of actual inks cannot produce pure black.

surrogate image
A digital image derived from the archival Image. Usually not as high resolution as the archival image, surrogate images are usually used as output images on display devices or printers.

thumbnail image
Small, low-resolution preview image, often linked to a high-resolution version of the same image.

TIFF
Tagged Image File Format is an image file format used extensively for the storage of high-quality images.

transparent media adaptor
Part of a flatbed scanner used when scanning film or transparent media that allow light to pass through the media during the scanning process. Usually an optional extra.

true-colour image
A 24-bit image.

TWAIN
An acquire interface developed by a consortium of software developers as a standard for communications between scanners, imaging devices and now digital cameras and the computer software.

USB
Universal Serial Bus, a device allowing for easy connection of serial devices to PC. The aim of USB is to eliminate the serial port bottleneck that has plagued PCs since the beginning. Many newer peripheral devices such as digital cameras and scanners support USB.

vector graphic
An image composed of individual elements, e.g., arc, line, polygon, with their own attributes that can be individually edited. A drawing-type package is usually required to display such vector images.

watermark
Bits altered within an image to create a pattern that indicates proof of ownership. Unauthorized use of a watermarked image can then be traced.

white balance
How the colour white is reproduced. On a monitor the white point is the combination of all three red, green and blue phosphors at full intensity, as measured by its colour temperature in degrees K. It is used as a reference point in calibration.

WORM
Write Once; Read Many; refers to data storage that cannot be changed once written, though it may be read as many times.

YCC
A colour encoding scheme developed by Kodak.

ZIP
A ompression format. Files compressed with PKZip or WinZip are the most common archive format.

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USEFUL SOFTWARE

Software	Greenstone
Type	Digital library collection builder
Price	Open source/free
URL	http://www.greenstone.org

Software	DSpace
Type	Content archiver
Price	Open source/free
URL	http://www.dspace.org

Software	Adlib Lite
Type	Museum catalogue builder
Price	Free (limit 5,000 records)
URL	http://www.adlibsoft.com

Software	GCStar
Type	Cataloguing
Price	Open source/free
URL	http://www.gcstar.org

Software	MessLess Inventory
Type	Cataloguing
Price	Commercial - USD60
URL	http://www.messless.com/mli

Software	Canto Cumulus
Type	Digital asset management
Price	Commercial
URL	http://www.canto.com

Software	Collection Mosaic Plus
Type	Historical collection catalogue builder
Price	Commercial
URL	http://www.istechnology.com.au

Software	PastPerfect
Type	Collection database & management
Price	Commercial
URL	http://www.museumsoftware.com

Software	QPColorsoft 501
Type	Colour management tool for QPcard 201
Price	Free - requires QPCard (18 euro for two)
URL	http://www.qpcard.se

Software	Adobe DNG Converter
Type	RAW conversion to DNG
Price	Free
URL	http://www.adobe.com

Software	Faststone Viewer
Type	Image viewer and batch converter
Price	Free
URL	http://www.faststone.org

Software	Areca Backup
Type	Backup
Price	Open source/free
URL	http://areca.sourceforge.net

Software	md5summer
Type	Checksum creator and verifier
Price	Free
URL	http://www.md5summer.org

Software	DRIFTT
Type	RAW to DNG and TIFF converter
Price	Free
URL	http://www.nla.gov.au/preserve/dohm

Software	CoCa
Type	Colour profile creator for cameras/scanners
Price	Open source/free
URL	http://www.nla.gov.au/preserve/dohm

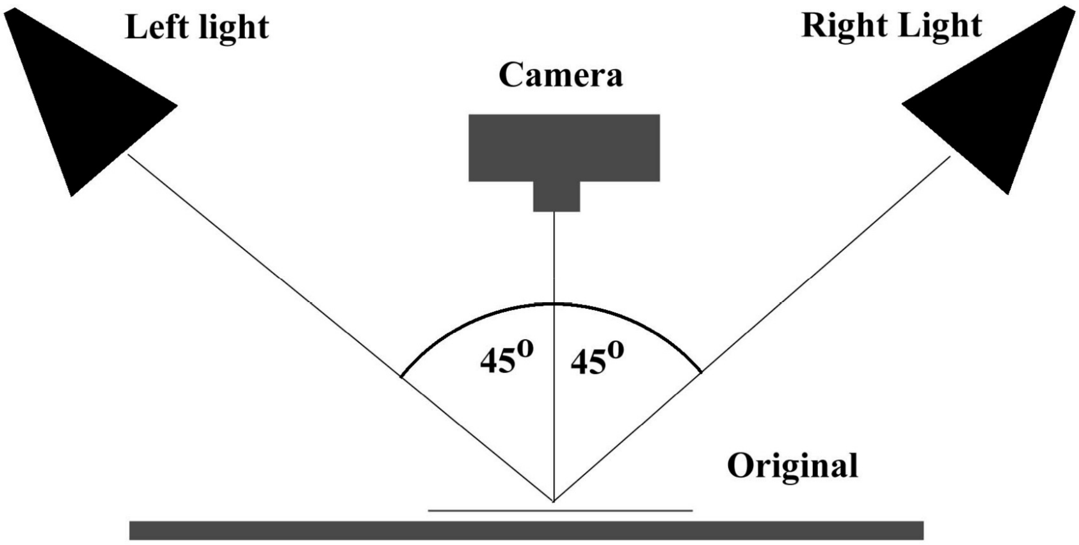
Software	ResourceSpace
Type	Digital Asset Management Software
Price	Open source / free
URL	http://www.resourcespace.org

INITIAL CAMERA SETUP

NOTES: Select a camera with at least 10Mpixel resolution and a large lens. Preferably, the camera should have an option to shoot RAW.

1. Turn the camera on.
2. Set camera to **MANUAL MODE**.
3. Set camera to **MANUAL FOCUS**.
4. Set **zoom** to approx. middle of the scale. Digital zoom should be disabled.
5. Turn the **electronic flash** to **OFF**.
6. Set **ISO** number to the lowest value (most likely **50** or **100**).
7. Set **quality** to highest (**RAW** if available).
8. Set **picture size** to largest.
9. Set **White Balance** to a suitable preset (**Tungsten, Daylight or Electronic Flash**). IMPORTANT: **White Balance** cannot be set to **Auto**).
10. Set **Metering Mode** to **Spot**.
11. Make sure **EV** is set to **0**.
12. Make sure all **Picture Effects** are turned **OFF**.

STUDIO CAPTURE SET-UP



Positioning of the camera and lights

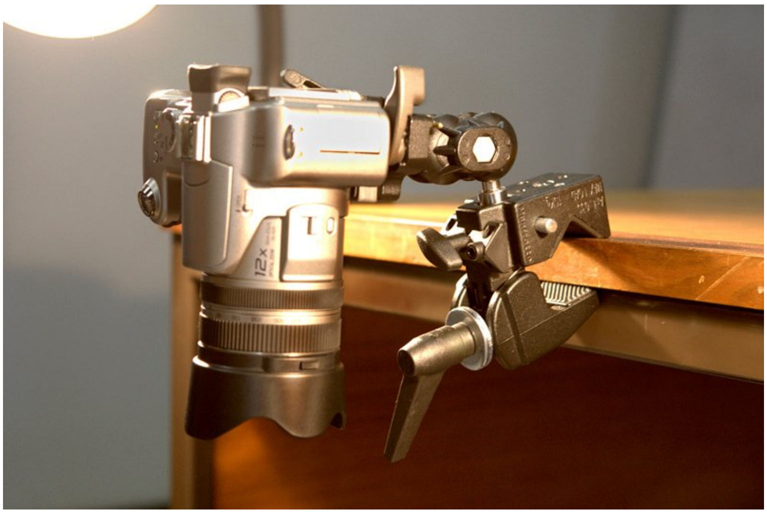
Preparation:

1. Follow the “Initial Camera Setup” (previous page).
2. Set the lights and allow them to warm up for a few minutes.
3. Put the original material in place. Make sure that there are no reflections from the lights. Adjust the lights if necessary.
4. Turn the camera on. Check the battery status, recharge if necessary. Insert the SD memory card.
5. Set camera’s aperture between 4 and 5.6.
6. Using a light meter check evenness of the lighting (middle of the frame and all four corners).
7. Secure camera to the stand/holder, adjust the required height and check with a spirit-level its position.
8. Adjust shutter speed for correct exposure with help of the middle patch (18% neutral grey) of the QPCard 101.
9. Put the QPCard 201 reference sheet (page 166 in the printed DOHM manual), together with the QPCard **201,** under the camera.
   Important: This is different QPCard to 101 type. It contains colour patches. This image will become a colour reference for the collection shot in the session.
10. Focus the camera.
11. Take a shot using remote shutter release or camera’s self-timer. Make sure that you don’t touch the equipment and original material during the exposure.

Capturing collection items:

12. Position the original material item under the camera.
13. Put the QPCard 201 (without the reference sheet) next to the original and make sure that it is included in the frame.
14. Check the appearance of the image on the camera’s LCD. Focus the image
15. Take a shot using remote shutter release or camera’s self-timer.
16. Shoot other items in the batch following steps from 12 to 15. When the memory card is full, upload images to the PC.

THE LEAST EXPENSIVE STUDIO SETUP EXAMPLE



Equipment

Camera: Panasonic Lumix FZ-50
Price: AUD750 (year 2006)

Remote shatter release: Panasonic DMW-RS1 (could use self-timer instead)
Price: AUD30

Camera clamps: Manfrotto
Price: AUD150 (cheap option – www.highsierramfg.com- USD10)

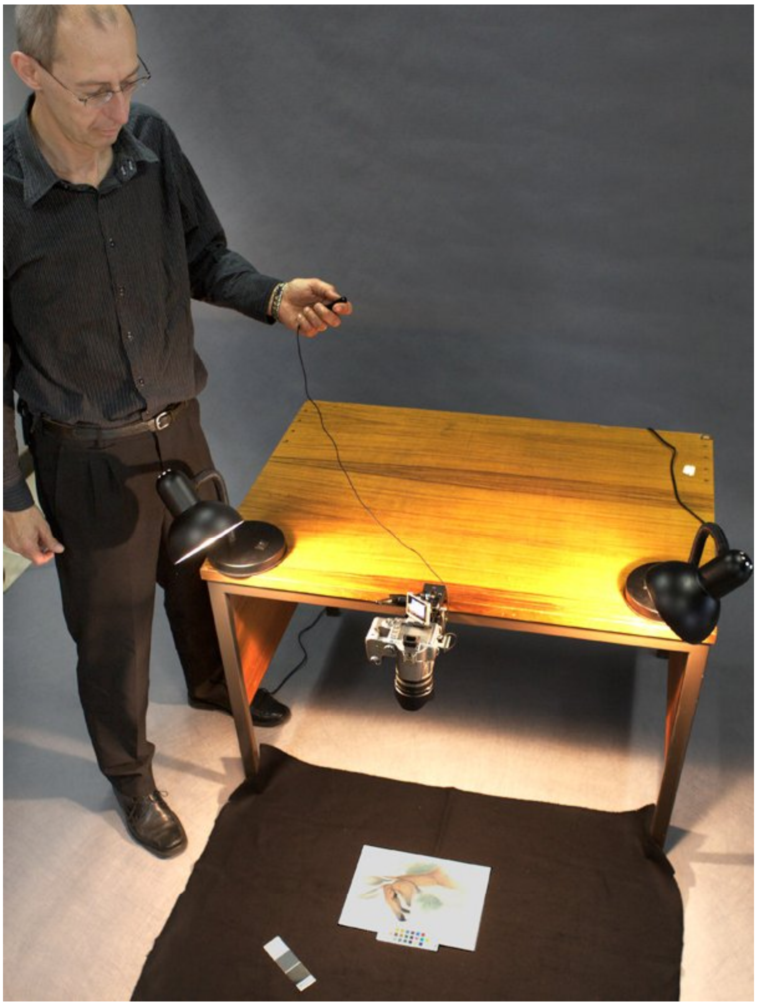
Lights: Any desk lamps with incandescent (ordinary) bulbs
Price for 2: AUD40

Target: QPCard 201
Price: 16 euro

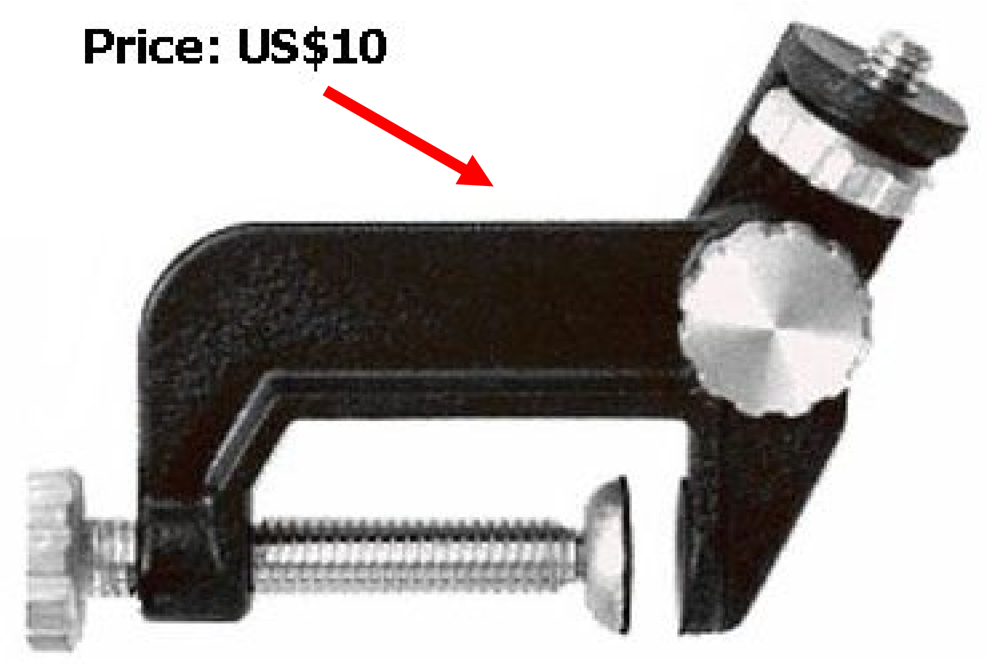
Table: Any decent (stable) table
Price: Nil (in most cases…)

Spirit level to adjust camera
Price: AUD10

TOTAL:	**max** AUD1,009 **min** AUD839

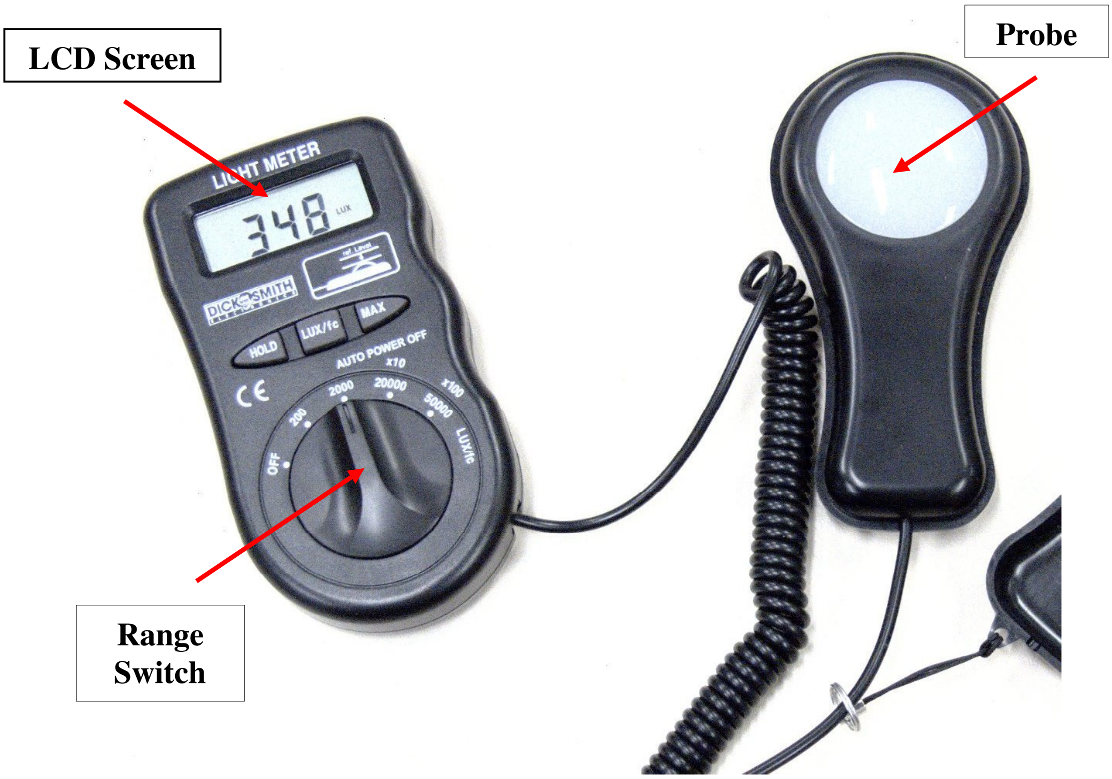


Example Equipment



http://www.highsierramfg.com/

Jaycar Electronics Digital Light Meter



Light Meter is an inexpensive (about AUD59) option for checking evennes of lighting in the studio setup. It is accurate enough for our purpose. To proceed follow the steps below:

1. Set up the lights as described in Studio Capture Set-up (previous page)
2. Outline the capture area under the camera.
3. Put the Light Meter probe in the middle of the capture area.
4. Turn on the meter by switching it to “200” range. If the display indicated “OL”, keep switching the meter to the next higher value until it displays digits.
5. Make sure the meter is in “LUX” mode (indicated on the LCD screen).
6. Write down the number.
7. Move the probe to the upper left corner of the capture area. Write down the number.
8. Repeat the procedure for all remaining corners of the capture area.
9. If the difference in numbers is less than 30 for 200 range or less then 3 for 2000 range the lighting is uniform. Otherwise, you need to re-adjust the lights until the lighting is even.

QPCard 201 Reference Sheet

QPcard 201 Patch Numbers

QPcard 201	1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15	16	17	18	19	20
	21	22	23	24	25	26	27	28	29	30

Patch				L*a*b D65 10°			AdobeRGB (1998)		
No	X	Y	Z	L	a	b	R	G	B
1	47,8	50,5	53,2	76	0	1	186	186	184
2	9,3	9,6	27,6	37	1	-36	66	89	142
3	60,7	62,1	11,2	83	4	76	230	201	64
4	4,4	4,6	4,9	26	0	0	64	64	64
5	10,5	11,1	11,9	40	0	0	94	94	94
6	16,8	17,8	19,5	49	0	-1	115	116	117
7	32,9	34,7	36,8	66	0	1	159	159	157
8	65,1	68,9	72,5	86	0	1	214	214	212
9	81,8	86,6	91,0	95	-1	1	239	241	238
10	47,8	50,5	53,2	76	0	1	186	186	184
11	36,9	43,1	7,0	72	-13	71	179	180	46
12	15,7	26,5	17,4	59	-47	19	92	161	109
13	29,8	19,5	20,8	51	50	0	171	81	122
14	6,2	5,7	7,9	29	9	-7	76	66	80
15	10,1	12,3	6,8	42	-12	20	93	104	69
16	19,9	20,5	6,5	52	2	39	136	121	62
17	11,0	9,9	6,8	38	12	13	105	83	71
18	36,2	34,2	25,0	65	13	17	177	148	128
19	60,7	67,5	73,7	86	-8	-1	203	219	216
20	56,3	56,5	70,3	80	7	-8	202	193	212
21	47,8	50,5	53,2	76	0	1	186	186	184
22	14,5	8,9	4,3	36	44	21	130	50	57
23	18,6	24,8	52,5	57	-24	-32	81	149	189
24	9,6	7,2	6,1	32	25	6	101	61	69
25	18,0	19,8	34,8	52	-4	-21	108	126	157
26	43,0	30,9	5,8	62	46	60	209	112	49
27	57,0	49,6	6,6	76	26	80	233	166	37
28	69,3	68,9	47,9	86	9	24	234	207	170
29	64,5	69,9	59,9	87	-4	13	217	219	193
30	47,8	50,5	53,2	76	0	1	186	186	184

NOTES:

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